MACHINERY

AUGUST 6, 1958 ONE SHILLING & THREEPENCE

Speetog Vertical Lift Clamp | Model ST 210

REGD. TRADE MARK

PATENT No. 778865

Due to its unique system of linkage, this clamp has two outstanding features. Firstly, the spindle travels in a vertical direction substantially throughout its travel so that it is possible to clamp into or through locating holes. Secondly it can be operated in a very confined space and providing there is 4" available behind the component being clamped, or a total space of $5\frac{3}{4}$, for instance between pillars then this clamp can be operated satisfactorily.

Fully Open Position Shows Space Economy. This Clamp Can Be Used in a Confined Space of $5\frac{3}{4}$"

Speed Tools Ltd

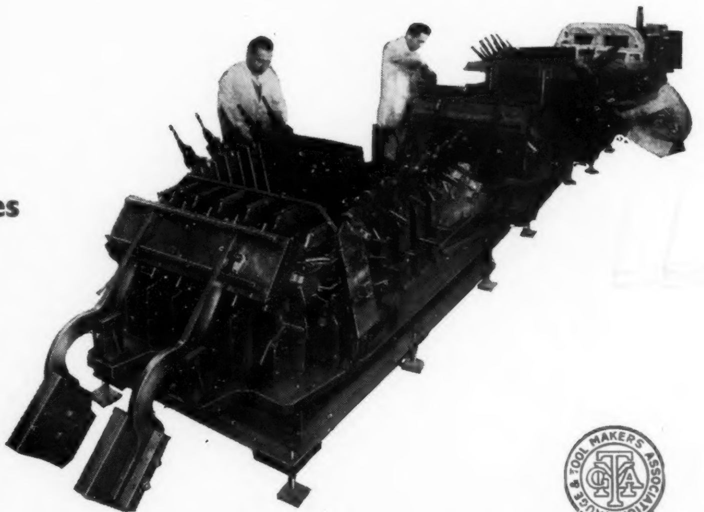
VEREKER HOUSE, GRESSE ST., LONDON W.1. Museum 1039/1099.

Literature on Request

---

very large

. . . jigs and fixtures



Our Machine Shops are laid out for

EXPERIMENTAL MACHINING

DEVELOPMENT WORK

PRODUCTION—
LONG OR SHORT RUNS

AUTOMATION AND SPECIAL PURPOSE MACHINERY

GAUGE & TOOL MAKERS ASSOCIATION

Fully A.I.D. approved
Ref. No. 793672/38

We can work to the finest limits on the **FINEST MACHINE TOOLS**

LEYTONSTONE JIG & TOOL CO. LTD. LEYTOOL WORKS, HIGH ROAD, LEYTON, LONDON, E.10

Telephone: LEYtonstone 5022-3-4

For MORE ACCURATE GEARS...

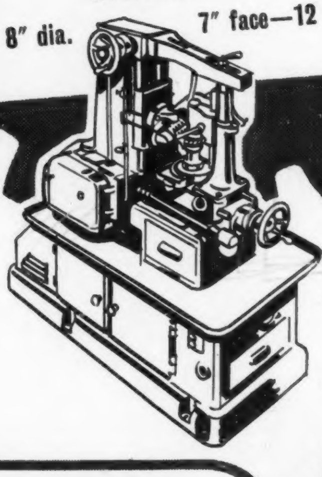
SPURS
HELICALS
WORMWHEELS
SPLINES
SERRATIONS

DOWDING

UNIVERSAL HOBBER

Model V.8

8″ dia. 7″ face—12 D.P.



If you want more accurate gears—and we do mean *more* accurate—then you need a DOWDING V.8. From the drawing board right down to the last detail of production the V.8 is designed and built to produce more gears—more accurately. Amply rigid for production hobbing—climb or orthodox. Built-in differential for helicals. Fast traverse, tangential feed and cam operated plunge feed too—if you need them. Hundreds of DOWDING hobbers are in constant service, many users having multiple installations.

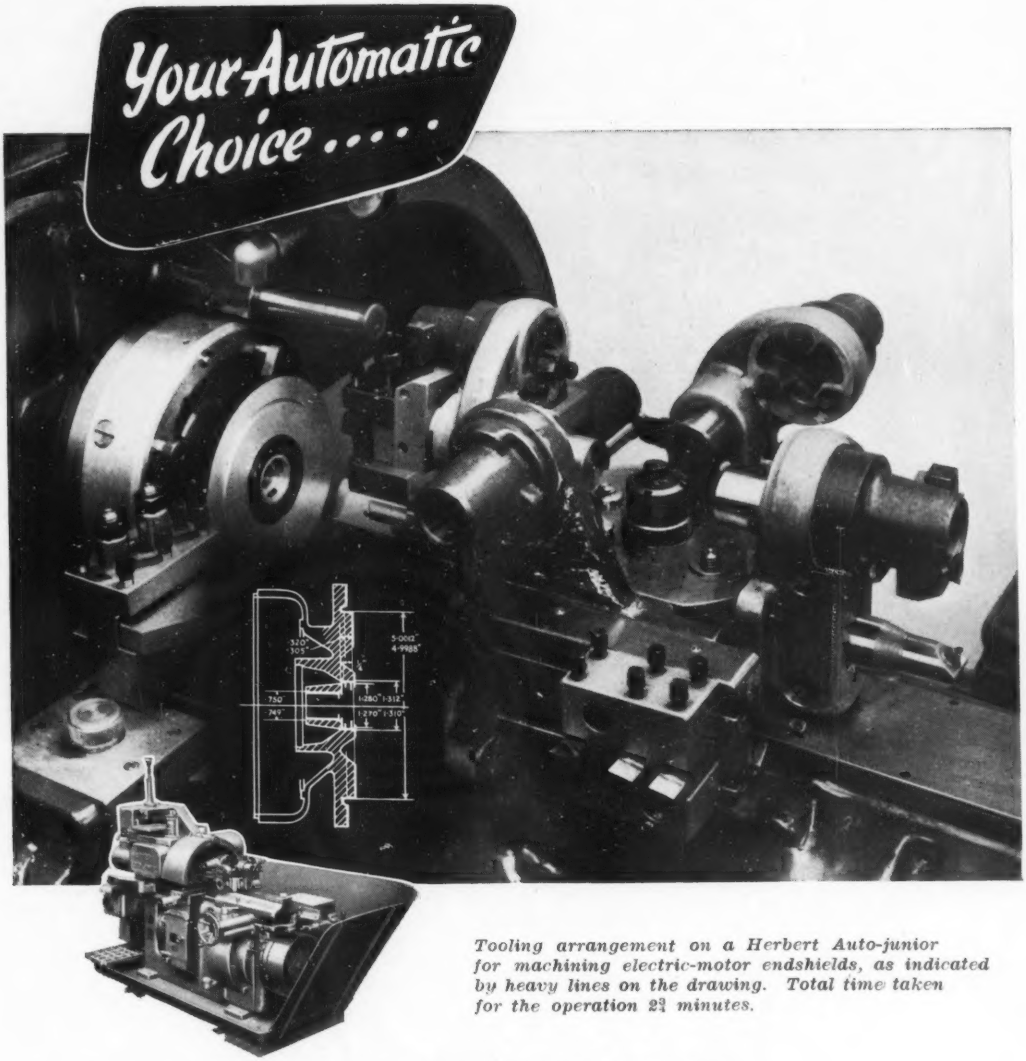
DOWDING & DOLL LTD

346 KENSINGTON HIGH STREET, LONDON, W.14

Telephone WESTERN 8077 (8 lines) Telegrams: ACCURATOOL HAMMER LONDON

Write for this catalogue today

148



Tooling arrangement on a Herbert Auto-junior for machining electric-motor endshields, as indicated by heavy lines on the drawing. Total time taken for the operation 2¾ minutes.

—for high-production repetition work with consistent accuracy.
Greatest output per foot of floor space at lowest labour cost per piece—one operator and one tool setter can keep from four to six machines in continual operation.
Power, rigidity and speed ranges to take full advantage of Ardoloy and other carbide tooling.
All operations except chucking and removing the work are entirely automatic.

Herbert Auto-lathes are made in five sizes: **Auto Junior—8½" swing, No. 3A—12½" swing, No. 4—16½" swing, No. 5A—25" swing, and No. 5A/33—33½" swing.**

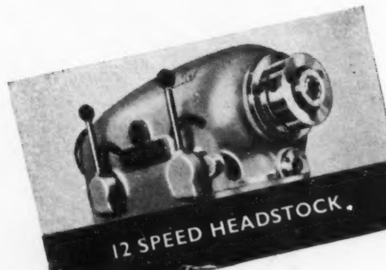
Available for Early Delivery

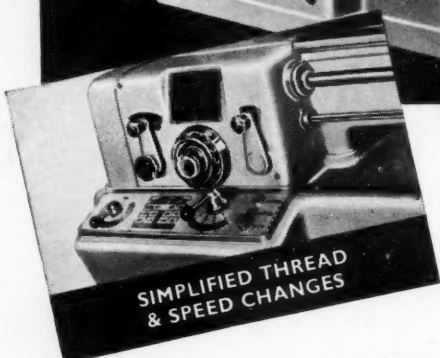
Ask for brochure " Production on Herbert Auto-lathes "

ALFRED **HERBERT** LTD., COVENTRY

AD.386

New! Smart & Brown Precision Toolroom Lathe





MODEL 1024

The latest addition to the range of Smart & Brown toolroom lathes has been designed to ensure the highest degree of accurate operation while reducing operator's unproductive time to a minimum.

FEATURES

- 12 Spindle Speeds 30-2500 RPM
- 1″ Collet Capacity
- Easy Selection of 40 Threads and Feeds 4-112 TPI
- Cam Lock Spindle Nose 4″ D.I.
- Flame Hardened Bed
- Easy to Read Thread Dial Indicator
- Fully Protected, Easily Accessible Electrical Equipment
- Swing Over Bed 11″
- Distance Between Centres 24″

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 · STOCKPORT—TEL: STOCKPORT 5241 · GLASGOW—TEL: MERRYLEE 2822

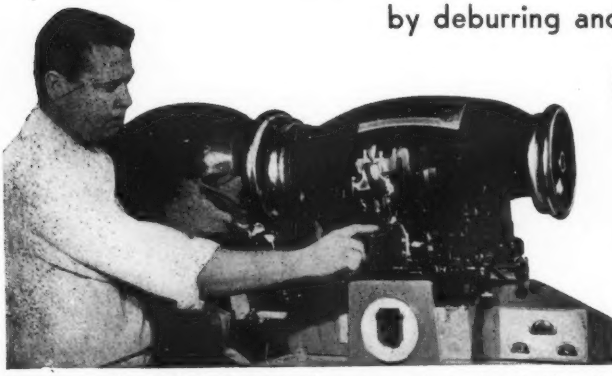
DEVELOPMENT ENGINEER AT LANDIS MACHINE CO. REPORTS . . .

"We cut costs from £20 to 4/- per 100"

by deburring and finishing needle plates with

Barrel Finishing Equipment

ALMCO



Mr. James W. Dunford, development engineer at Landis Machine Co. points to location of needle plate in new model of Landis shoe repair machine.

BEFORE AFTER

One of the most successful barrel finishing applications on record at Almco is this needle plate deburring and finishing at Landis Machine Company.

The needle plate forgings are drilled and broached and then carefully deburred and finished. Formerly the cost of finishing and removing the tough burrs by hand filing was £20 per 100.

Now, an Almco Model DB-200 barrel finishing machine performs the same operation at a cost of 4/- per 100, a savings of 99%!

VERSATILE EQUIPMENT

By keeping simple records on processing cycles, correct media and compound, and proper scheduling, Landis engineers can switch the Almco equipment from part to part, to meet plant production requirements exactly.

BROAD EXPERIENCE FOR YOU

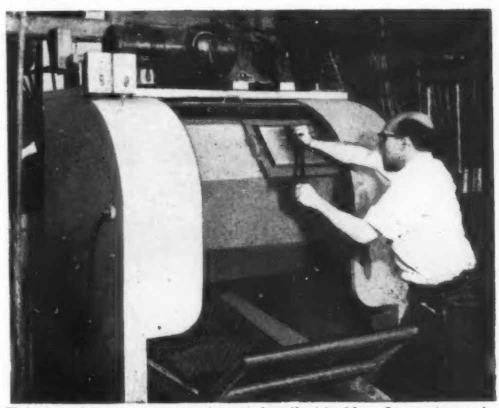
Almco's experience in barrel finishing methods and techniques now covers a wide range of parts, sizes, shapes, metals, and operations. Almco maintains sample processing laboratories for the purpose of analysing product parts and desired results. Let Almco technicians work out procedures to give you the quality you want at the lowest possible finishing cost.

REQUEST YOUR REPORT

Simply write on your company letterhead, requesting an Almco engineer to call on you. Or, send your sample parts and specifications on results direct to Almco. You will receive a detailed report at no obligation.

MANY LANDIS PARTS NOW BARREL FINISHED

With this £1,143 annual saving on needle plates alone in mind, Landis engineers have applied the Almco method to other parts until the company is now barrel finishing several hundred different parts to high quality standards. Rejects are practically non-existent.



Finishing department operator at Landis Machine Co. gets ready for parts deburring run in Almco barrel finishing machine. Almco construction is heavy-duty throughout, to stand up under rugged requirements month after month.

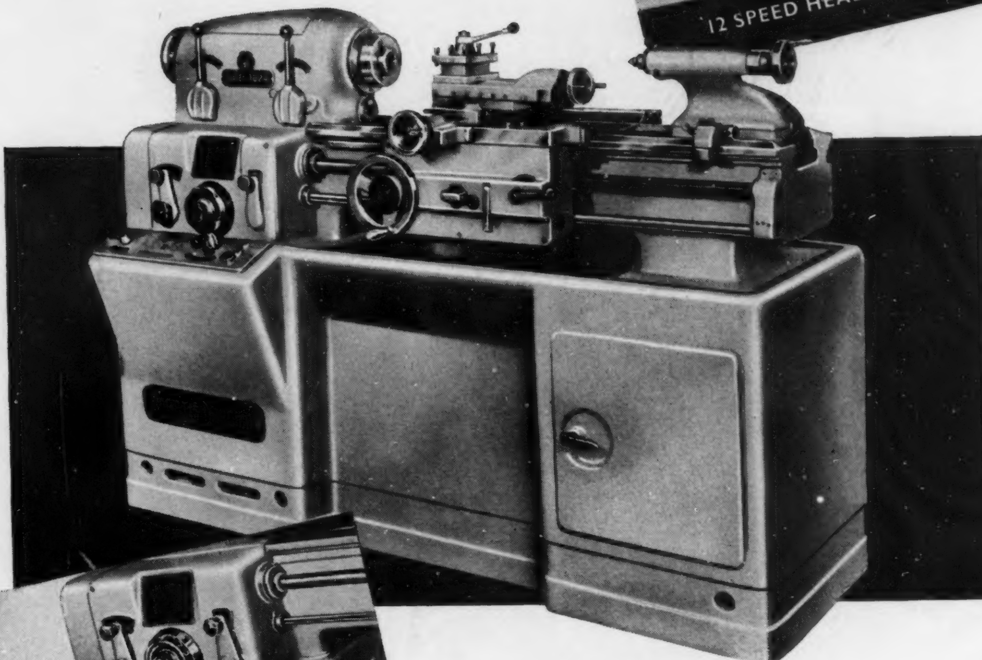
ALMCO Supersheen

BURY MEAD WORKS · HITCHIN · HERTS

Telephone: Hitchin 3669

HOLLAND (Rotterdam) N.V. Technische Handelsonderneming "Carborundum-Aloxite" : **BELGIUM & LUXEMBURG (Bruxelles)** Tecnimetal Societe Anonyme : **SWEDEN (Stockholm)** Trumlingsaktiebolaget : **SWITZERLAND (St. Gallen)** L. Kellenberger & Co. : **SOUTH AFRICA (Johannesburg)** Barry Colne & Co. (Pty.) Ltd. : **AUSTRALIA & NEW ZEALAND (Melbourne)** Hardie Trading Ltd.

New! Smart & Brown Precision Toolroom Lathe



MODEL 1024

The latest addition to the range of Smart & Brown toolroom lathes has been designed to ensure the highest degree of accurate operation while reducing operator's unproductive time to a minimum.

FEATURES

- 12 Spindle Speeds 30-2500 RPM
- 1″ Collet Capacity
- Easy Selection of 40 Threads and Feeds 4-112 TPI
- Cam Lock Spindle Nose 4″ D.I.
- Flame Hardened Bed
- Easy to Read Thread Dial Indicator
- Fully Protected, Easily Accessible Electrical Equipment
- Swing Over Bed 11″
- Distance Between Centres 24″

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 · STOCKPORT—TEL: STOCKPORT 5241 · GLASGOW—TEL: MERRYLEE 2822

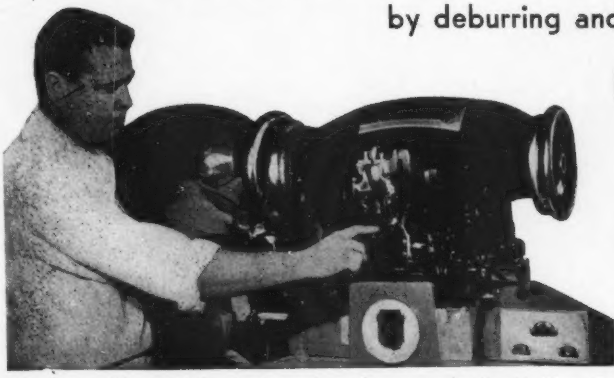
DEVELOPMENT ENGINEER AT LANDIS MACHINE CO. REPORTS . . .

"We cut costs from £20 to 4/- per 100"

by deburring and finishing needle plates with

Barrel Finishing Equipment

ALMCO



Mr. James W. Dunford, development engineer at Landis Machine Co. points to location of needle plate in new model of Landis shoe repair machine.

BEFORE AFTER

One of the most successful barrel finishing applications on record at Almco is this needle plate deburring and finishing at Landis Machine Company.

The needle plate forgings are drilled and broached and then carefully deburred and finished. Formerly the cost of finishing and removing the tough burrs by hand filing was £20 per 100.

Now, an Almco Model DB-200 barrel finishing machine performs the same operation at a cost of 4/- per 100, a savings of 99%!

VERSATILE EQUIPMENT

By keeping simple records on processing cycles, correct media and compound, and proper scheduling, Landis engineers can switch the Almco equipment from part to part, to meet plant production requirements exactly.

BROAD EXPERIENCE FOR YOU

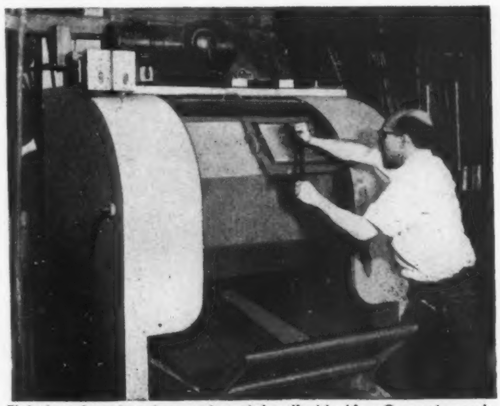
Almco's experience in barrel finishing methods and techniques now covers a wide range of parts, sizes, shapes, metals, and operations. Almco maintains sample processing laboratories for the purpose of analysing product parts and desired results. Let Almco technicians work out procedures to give you the quality you want at the lowest possible finishing cost.

REQUEST YOUR REPORT

Simply write on your company letterhead, requesting an Almco engineer to call on you. Or, send your sample parts and specifications on results direct to Almco. You will receive a detailed report at no obligation.

MANY LANDIS PARTS NOW BARREL FINISHED

With this £1,143 annual saving on needle plates alone in mind, Landis engineers have applied the Almco method to other parts until the company is now barrel finishing several hundred different parts to high quality standards. Rejects are practically non-existent.



Finishing department operator at Landis Machine Co. gets ready for parts deburring run in Almco barrel finishing machine. Almco construction is heavy-duty throughout, to stand up under rugged requirements month after month.

ALMCO Supersheen

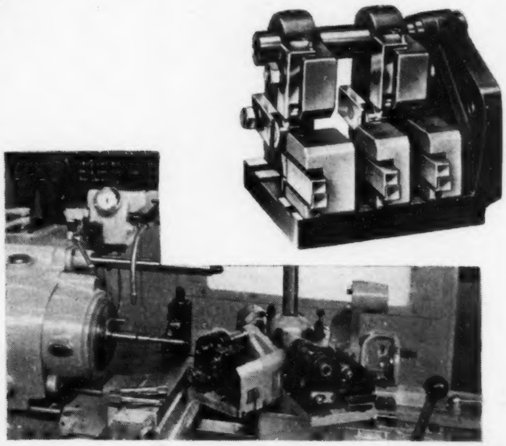
BURY MEAD WORKS · HITCHIN · HERTS

Telephone: Hitchin 3669

HOLLAND (Rotterdam) N.V. Technische Handelsonderneming "Carborundum-Aloxite" : **BELGIUM & LUXEMBURG (Bruxelles)** Tecnimetal Societe Anonyme : **SWEDEN (Stockholm)** Trumlingsaktiebolaget : **SWITZERLAND (St. Gallen)** L. Kellenberger & Co. : **SOUTH AFRICA (Johannesburg)** Barry Colne & Co. (Pty.) Ltd. : **AUSTRALIA & NEW ZEALAND (Melbourne)** Hardie Trading Ltd.


sliding surfacing and
screwcutting lathes.
LANG
13" and 17" swing.
model J6.
12 Spindle speeds—Nickel chrome, hardened and ground gears.
Pre-loaded spherical roller bearing spindle and the bearings pump lubricated with filtered oil.
Totally enclosed multi-feed gear-box.
Pump lubrication to feed gear-box, apron and saddle.
Hardened steel wear strips on under slideway faces of saddle.
All controls conveniently grouped.
ASSOC. BRITISH MACHINE TOOL MAKERS LTD
LONDON OFFICE
ASSOCIATED BRITISH MACHINE
TOOL MAKERS LIMITED
17 GROSVENOR GARDENS SW1
JOHN LANG & SONS LTD.
JOHNSTONE RENFREWSHIRE SCOTLAND
Telephone : Johnstone 400 Telegrams : "Lang Johnstone"

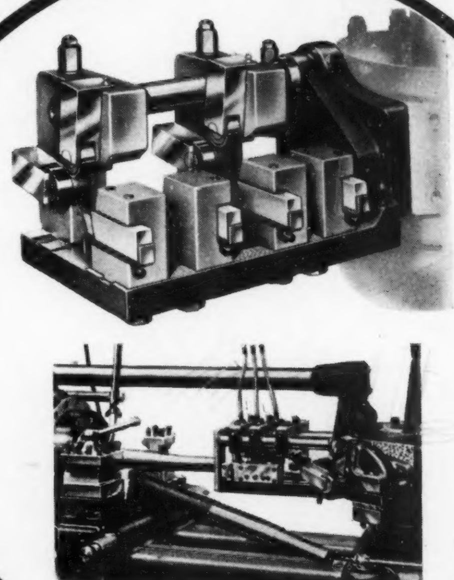
For stepped diameters at High Speeds



MULTIPLE TOOL HOLDER
FOR CAPSTAN LATHES

Ward

Multiple Roller Turning Toolholders



MULTIPLE TOOL HOLDER
FOR TURRET LATHES

Constructed for turning one, two, three or more diameters with tungsten-carbide tools, these holders present the tools to the work in quickly set robust slides having independent adjustment. The roller holders are interchangeable and can be locked in any position along the body.

MOST SIZES
FROM STOCK
OR EARLY DELIVERY

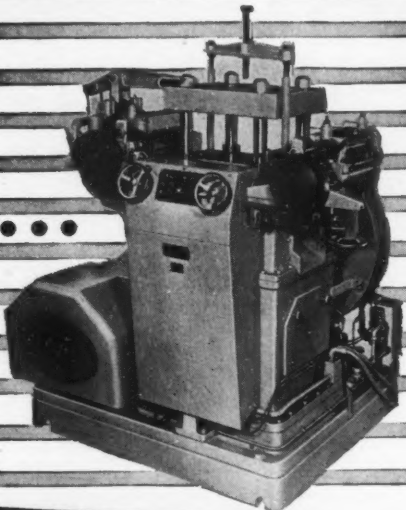
ASSOC. BRITISH MACHINE TOOL MAKERS LTD

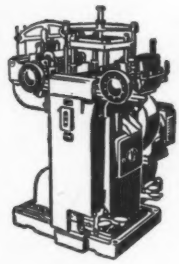
H. W. WARD & CO. LTD.

DALE RD., SELLY OAK, BIRMINGHAM 29

DESCRIPTIVE
LEAFLETS
ON APPLICATION

W.672



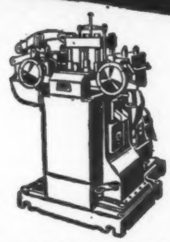


10 TON MODEL
3 speed ranges from 75 to 500 strokes per minute—5 h.p. variable speed motor—maximum stock width 5″ x 3/32″ thick.

CVA *High Speed* DIEING PRESSES

50 TON MODEL
4 speed ranges from 45 to 300 strokes per minute—12 h.p. variable speed motor—maximum stock width 12½″ x 3/16″ thick.

100 TON MODEL
2 speed ranges from 50 to 200 strokes per minute—30 h.p. motor—maximum stock width 15″ x ¼″ thick.



25 TON MODEL
4 speed ranges from 60 to 600 strokes per minute—7½ h.p. variable speed motor—maximum stock width 6¾″ x ⅛″ thick.

Power with a Punch!

E.H. JONES (MACHINE TOOLS) LTD

You will obtain **MORE COMPONENTS PER HOUR PER SQUARE FOOT OF FLOOR AREA** from C.V.A. Dieing Presses.

GARANTOOLS HOUSE
PORTLAND ROAD, HOVE, SUSSEX
Telephone: HOVE 47253 Telegrams: Garantools, Portslade

LONDON · BIRMINGHAM · EDINBURGH · MANCHESTER · BRISTOL

NRP

BUTTERLEY

MEEHANITE
Regd.

IRON CASTINGS

FOR THE

MACHINE TOOL INDUSTRY

Two examples of Butterley castings for machine tools—one a press body, the other an arm casting for a radial drill. In each case a first-class casting is required with rigidity, soundness and good machining properties.

The press bodies are cast in a Grade C Meehanite with tensile properties in the region of 18/20 tons per square inch. Weight 1,232 lb.

The radial drill arms are cast in a Meehanite giving a tensile of 15/17 tons per square inch. Weight 2,800 lb.

The word MEEHANITE is a Registered Trade Mark.

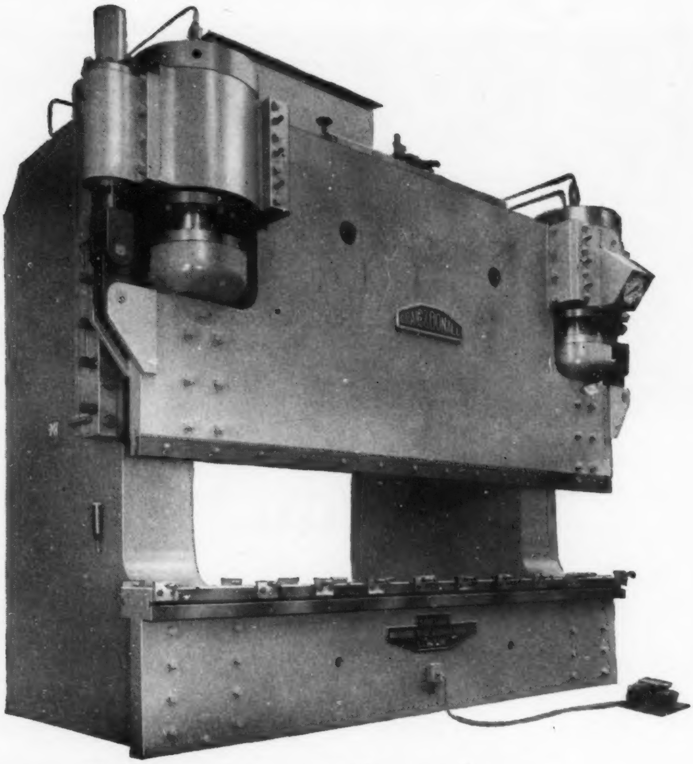
BUTTERLEY

THE BUTTERLEY COMPANY LTD · RIPLEY · DERBY · ENGLAND · Tel.: RIPLEY 411 (9 lines)

London Office: 9 UPPER BELGRAVE STREET, S.W.1 : Tel.: SLOANE 8172/3

C4

SCOTTISH machine tool corporation limited



craig & donald press brakes

Our new range of hydraulic press brakes is proving most successful and machines up to 500 tons capacity are now available. A very efficient compensating mechanism keeps the slide level even under unequal load and the control gear provides no less than seven different operating cycles, ensuring the best work at the highest speed.

17, Lynedoch Crescent, Glasgow, C.3. *DOUGLAS* 6586/9

58, Victoria Street, London, S.W.1. *VICTORIA* 2106

2, Sir Harry's Road, Edgbaston, Birmingham, 5. *CALTHORPE* 2541

The Building Centre, Brunswick Terrace, Leeds, 2. *LEEDS* 25250

SWIFT

TYPE 'A'

High Quality, Medium Capacity Lathes

Sales & Service for . . . **DRUMMOND-ASQUITH** *. . . the British Isles*

DRUMMOND-ASQUITH (SALES) LTD., KING EDWARD HOUSE, NEW ST., BIRMINGHAM

'Phone: Midland 3431 (7 lines) 'Grams: Maxishape, B'ham. Also at LONDON: Phone: Trafalgar 7224 (5 lines) and GLASGOW: 'Phone: Central 0922

S 301

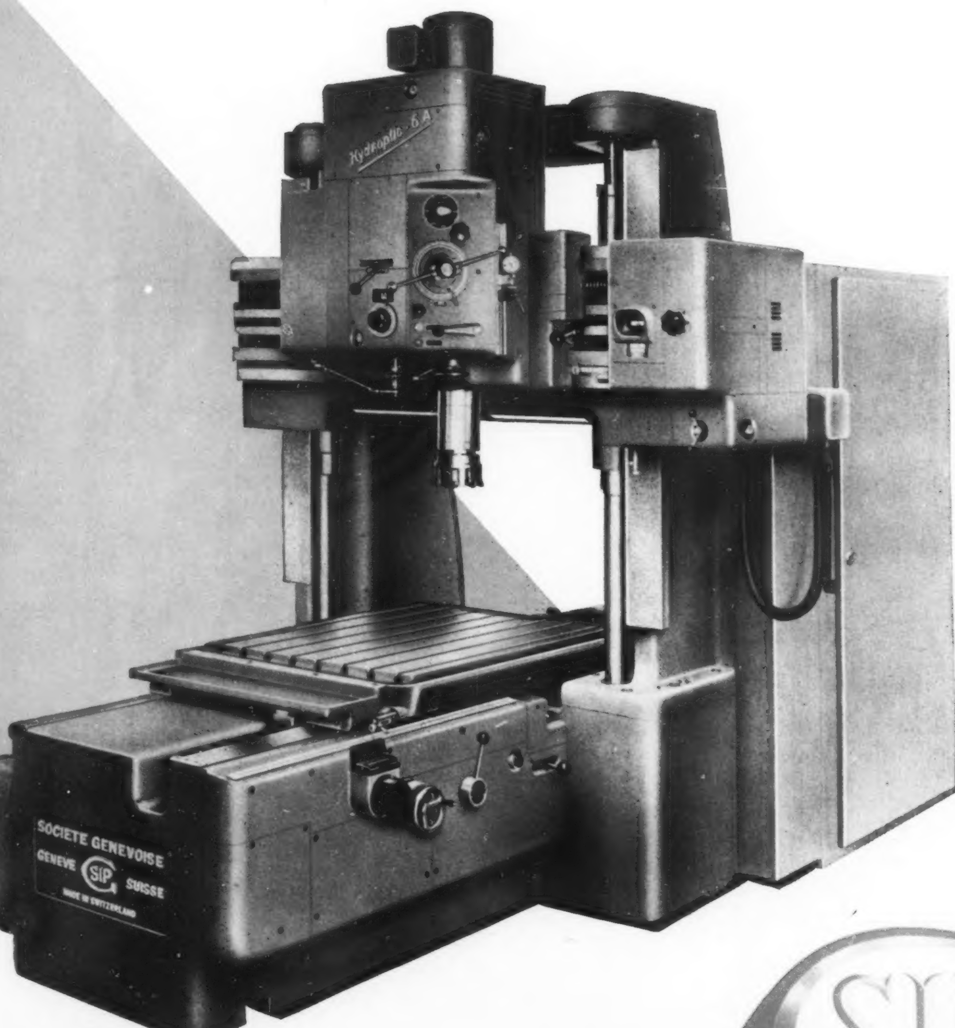
OPTIONAL AUTOMATIC REPEATING DEVICE

for increased production rates

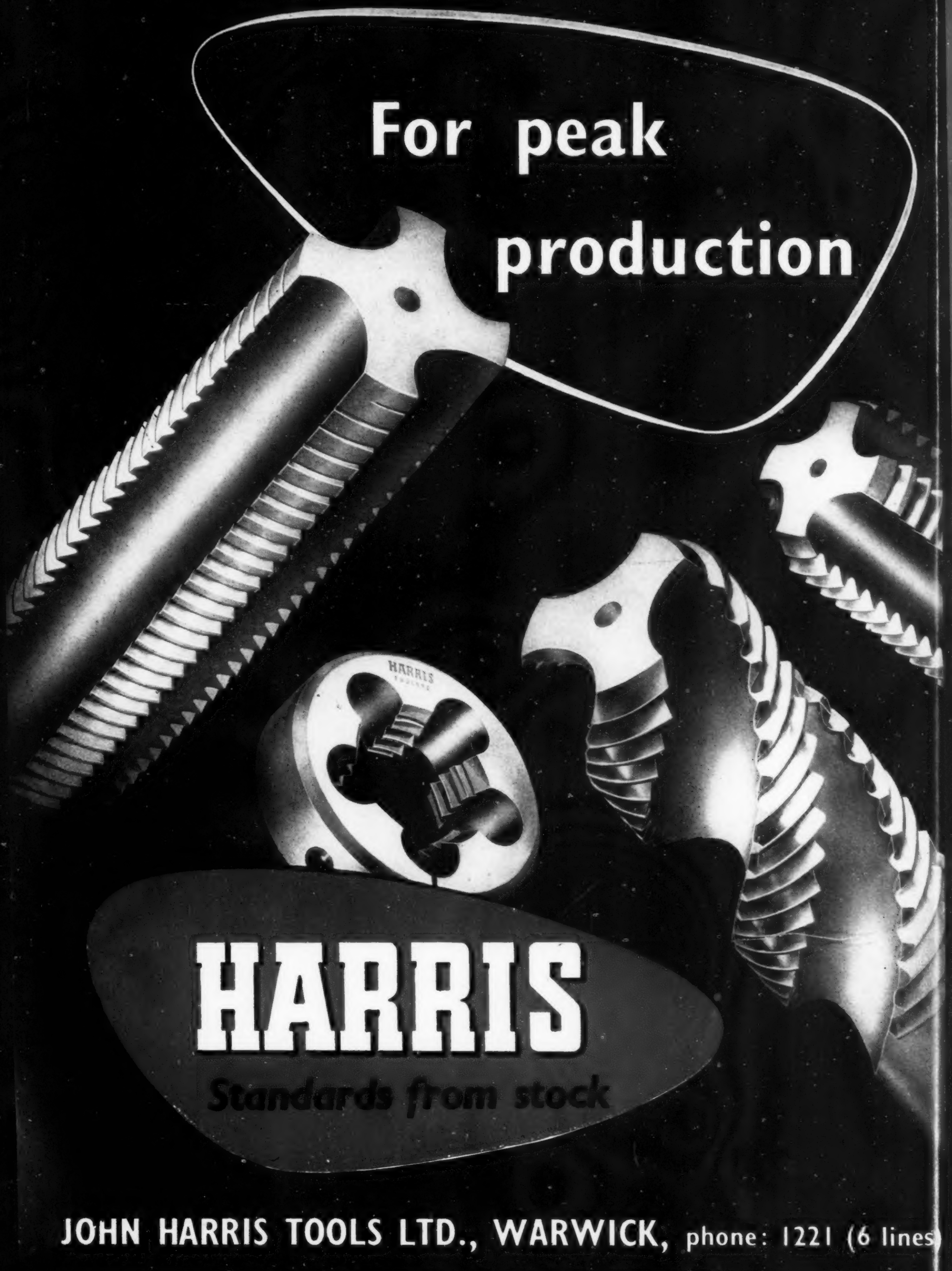
Production output can be increased substantially using the DIR Automatic repeating device, supplied as an optional extra.

The DIR records the co-ordinates of the first work-piece. Thereafter, these co-ordinates can be reproduced for subsequent workpieces at the touch of a button. At all times the operator is able to confirm the settings from the viewing screens, so ensuring complete confidence.

The DIR reproduces the recorded settings to an accuracy of ·00004".



Newport Pagnell - Bucks - Telephone 460-1-2


For peak production
HARRIS
Standards from stock
JOHN HARRIS TOOLS LTD., WARWICK, phone: 1221 (6 lines)
and at LONDON, GLASGOW, BIRMINGHAM


ESC
ESCALOY


PILOT
PILOT
PILOT

WYSSBROD

Semi-Automatic UNIVERSAL BORING MACHINE

- **Single or series production**
- **Repetitive co-ordinate positioning**
- **Automatic clamping and unclamping of the slides**
- **Electro-hydraulic control**
- **Optical readings to 0.0004"**
- **Light precision milling if required**
- **Rotary table 16" x 16" optional**

Brief specification :-	**Model B57**
Dimensions of table	26" x 20"
Longitudinal stroke	20"
Transverse stroke	12"
Vertical stroke	12"
Feeds (stepless) ins/min.	2–11¾
Spindle speeds, r.p.m. (16 steps)	48–4000

This hydraulically-operated machine, built by an old-established Swiss company to traditional Swiss standards of precision, is an economical production jig borer suitable for "one-off" or series production, without the need for costly jigs and fixtures.

Its system of repeat co-ordinate setting, allied to robust construction, ensures consistent positional accuracy to 0.0004". The table and headstock clamp and unclamp automatically, but can be released for milling operations, and the spindle speeds can be changed automatically if required.

Outstanding features are hydraulic power to the table and headstock ; stepless feeds ; wide range of spindle speeds ; manual fine adjustment ; optical scales, and centralised controls.

WICKMAN LIMITED

FACTORED MACHINE TOOL DIVISION, FLETCHAMSTEAD HIGHWAY, COVENTRY

Telephone : Coventry 74321

524F13/66

to strain,

or to filter...

diesel **FUEL** or **PETROL...**

lubricating,

edible, or cutting **OILS...**

AIR... LIQUIDS... POWDERS... DUSTS... GASES...

interpose an INTERMIT

filter, strainer, or gauze...

INTERMIT limited

specialists in the design and production of filters, strainers, and ventilators to specification or by collaborative research and development.

Enquiries to:
INTERMIT LIMITED · BRADFORD STREET · BIRMINGHAM 5
Phone: Midland 7961

Member of the BIRFIELD Group

BIRFIELD INDUSTRIES LIMITED · STRATFORD HOUSE · LONDON · W1

BALANCING

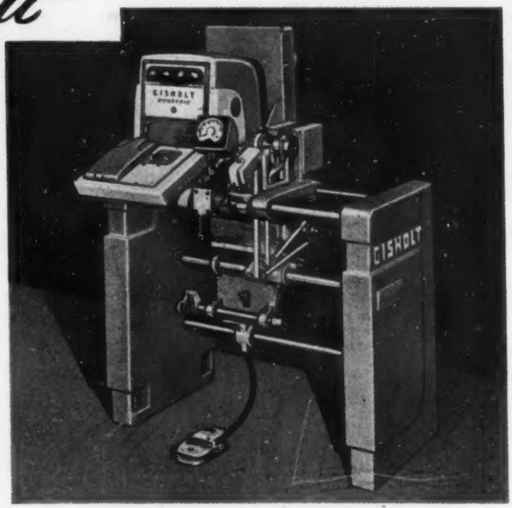
Balancing is a process whereby the distribution of mass in a rotor is altered to eliminate vibrations at the supporting bearings. To statically and dynamically balance a rotor, a balancing machine must indicate the amount and the angular location for correction of mass or weight required in each of two planes perpendicular to the axis. Gisholt Type S Balancers provide these indications — quickly.

The above illustration shows the operating principles of Gisholt Dynetric Balancing machines and depicts Type 1SB (BENCH model) for measuring and locating dynamic and static unbalance (either or both) causing vibrations from 0.000025 in., but not exceeding 3/32 in. at bearing surfaces of parts from 1 to 30 lb., 12 in. max. dia. up to 12 in. max. length, and $1\frac{1}{8}$ in. or less dia. at bearing surfaces. 1000 to 2500 r.p.m.

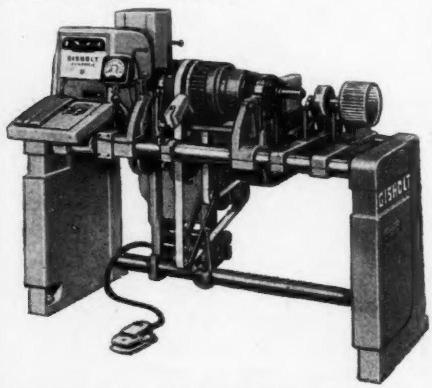
THE MODERN MEANS — Gisholt

The modern means for quickly and accurately measuring and locating unbalance in rotating parts is provided by GISHOLT balancing machines.

The Gisholt Machine Company (Great Britain) Limited, a subsidiary of Gisholt Machine Co., U.S.A., manufactures in this country the range of Dynetric type S horizontal dynamic balancing machines which handle work weighing from a fraction of a pound to 300 pounds and indicate, in each of two selected planes, the amount of correction material to be added or removed to obtain correct balance when vibrations at bearings are as small as 0.000025 in. and not more than 3/32 in. at bearings. When set-up the indication is given in only 15 seconds. Unbalance can be measured and corrected in the first of a new design of part in less than 15 minutes. The amount of correction may be read in any practical correction unit such as thousandths of an inch depth of drill or in 1/64 in. lengths of wire solder.



Type 1S (FLOOR type) same as 1SB, above, but including $\frac{1}{2}$ H.P. enclosed motor with brake and control. This machine and its BENCH version can be arranged for parts $2\frac{1}{8}$ in. or less dia. at bearing surfaces (weight capacity 2 to 50 lb.), alternatively $\frac{1}{2}$ in. or less dia. at bearing surfaces (weight capacity 4 oz. to 5 lb.).



Type 31S for measuring and locating dynamic and static unbalance (either or both) causing vibrations from 0.000025 in., but not exceeding 3/32 in. at bearing surfaces of parts 24 in. max. dia., 24 in. max. length. Max. dia. at bearing surfaces: $2\frac{1}{8}$ in. (weight capacity 2 to 50 lb.), or 5 in. (weight capacity 15 to 300 lb.), 1000 to 2000 r.p.m.

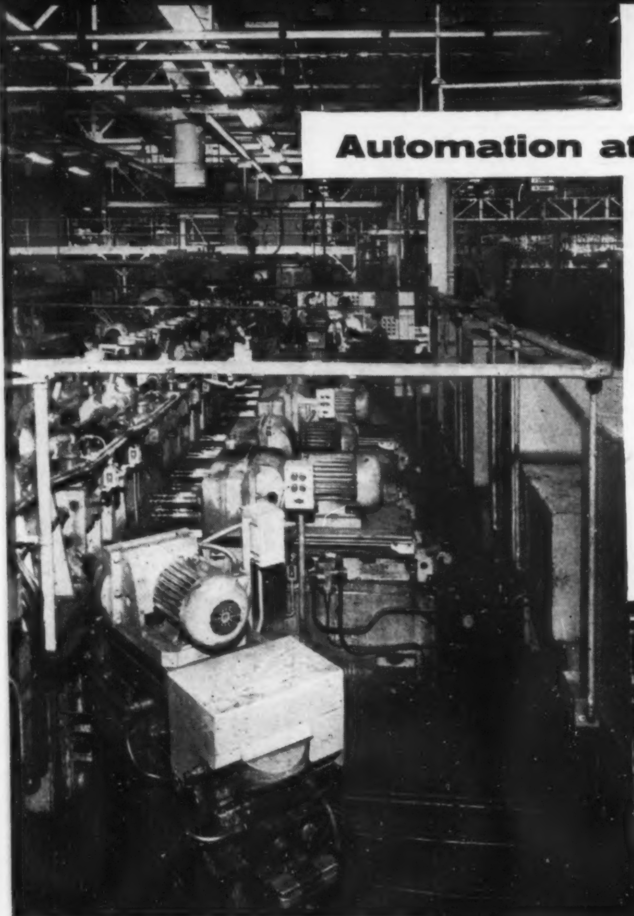
Standard machines can be arranged so that corrections for balance can be made in the balancer.

Gisholt, U.S.A., make a range of vertical Dynetric type S Balancers, a 'U' series for parts weighing from 25 to 300,000 lb., and special purpose balancing machines.

Sole Agents Gt. Britain:—
BURTON GRIFFITHS & CO. LTD.,
Kitts Green, Birmingham 33.
Tel: STECHFORD 3071.

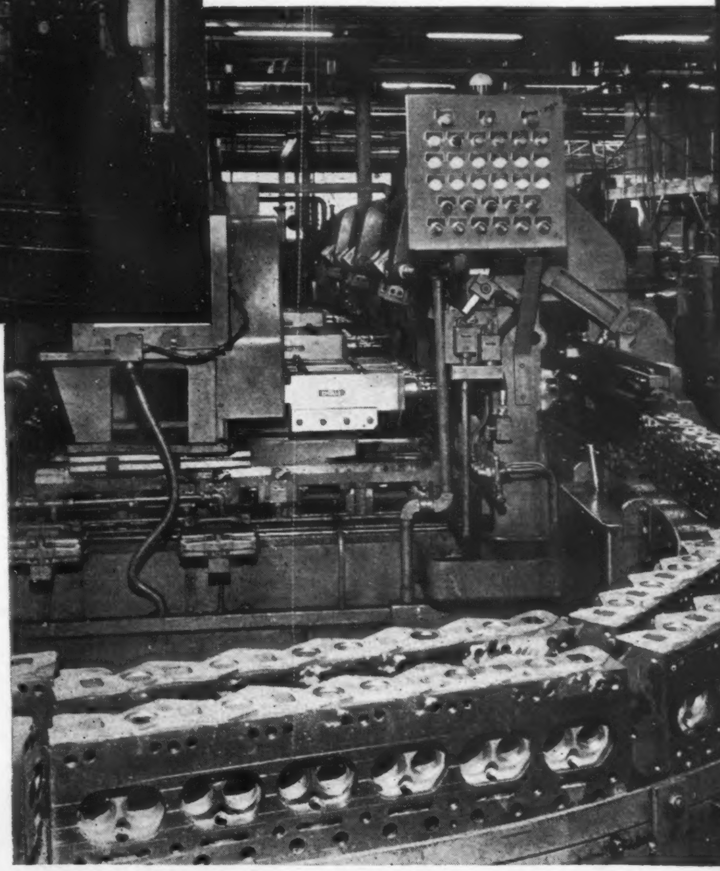
GISHOLT

BURTON GRIFFITHS



Automation at Vauxhall Motors

The continuous processes involved in producing the cylinder heads and cylinder block main bearing caps for all Vauxhall Victor, Velox and Cresta engines call for control mechanisms which ensure complete uniformity and flexibility and contribute to cost-reduction. VICKERS-DETROIT Oil Hydraulic mechanisms offer you these same advantages



(Above) the C.V.A. Kearney and Trecker 20-Station Transfer Drilling and Milling Machine for drilling, reaming, capping and lock tag slot milling operations on cylinder block main bearing caps. This machine cycles at 85 components per hour. To the right is the Ex-Cell-O 9-Station Transfer Fine Borer machining to fine bore the holes to receive the valve guides and to form the valve seat: cycling at 76 components per hour. All fixtures and transfer systems are actuated by VICKERS-DETROIT *Hydraulic equipment.*

British Made
VICKERS-DETROIT
OIL HYDRAULICS

For further details please write for publication 1/40

by STEIN ATKINSON VICKERS HYDRAULICS LIMITED

S.A.V. HYDRAULICS **60 Buckingham Palace Road London S.W.1**

Broadway/savh/40

Space saving at its maximum . . .

Renold Chain Drives can contribute in a big way to efficient space usage

Consider these facts :-

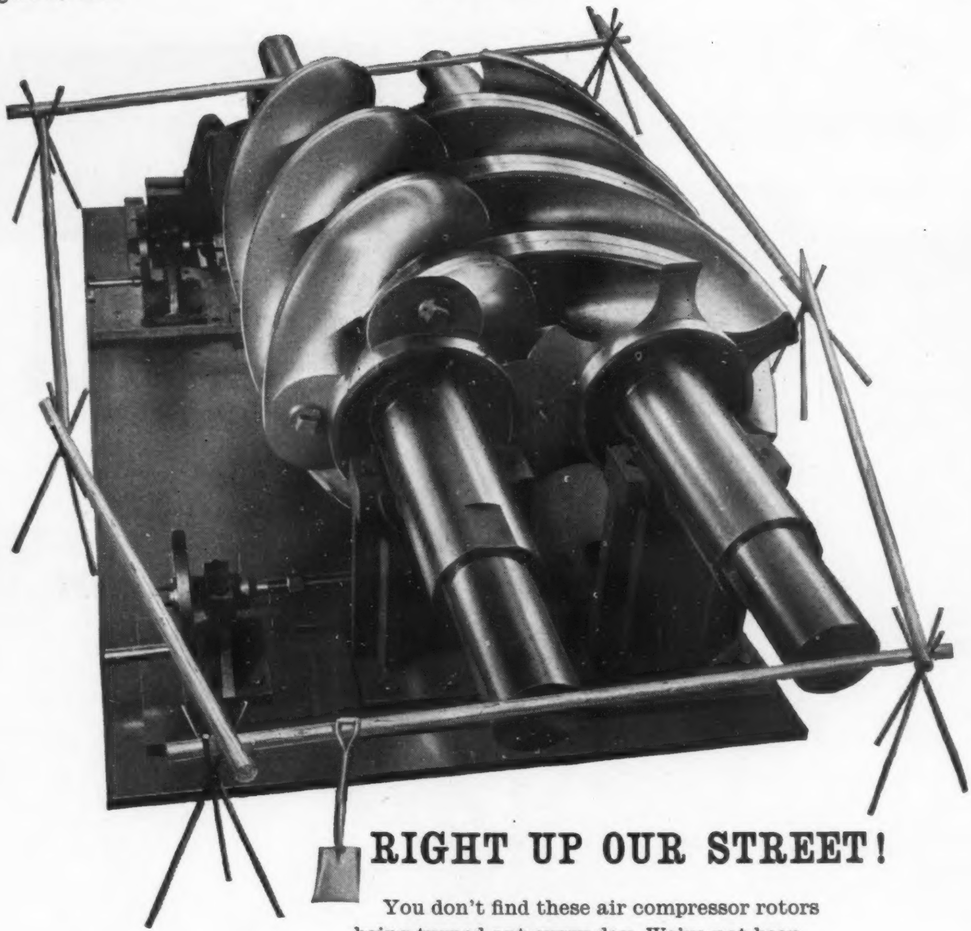
- Owing to its extreme strength in relation to its cross-sectional area, a narrow width of all-steel roller chain is able to transmit considerable power. In addition, as the contact between chain and wheels constitutes a gearing action, the ability to transfer power does not depend on frictional contact, i.e. on large wheel diameters.
- For the same reason, drive centres can be as short as desired, the clearance between wheel peripheries being the only limiting factor. Thus, in all three dimensions — length, height and width — Renold Chain Drives take up far less room than alternative transmissions relying on frictional contact.
- The compact dimensions of Renold Chain Drives often enable the motor to be mounted on or under the driven machine, with no encroachment on floor space — and space saved by the installation of Renold Chain Drives means space saved for additional plant.

RENOLD

— the FIRST name in precision chain

There is a Renold engineer in your area, always at your service to advise on power transmission problems.

RENOLD CHAINS LIMITED · MANCHESTER



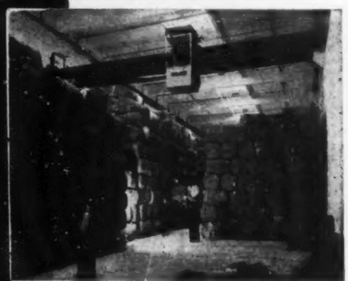
Big names leave him cold!

Crane buyers are not of course particularly influenced by long lists of famous users. Nevertheless it is comforting to know that when you buy a Clayton crane you are buying the utmost in modern mechanical reliability and performance. Precision built to British Standard Specification, every Clayton crane is designed to suit the specific application and conditions involved—with particular emphasis on ease of operation, ease of maintenance and—**mechanical reliability.**

• ASK FOR CATALOGUES

Our technical representatives, situated throughout the British Isles and most countries abroad, are ready to offer expert advice on any handling problem—without obligation.

One of 15 high speed cab-operated cranes supplied to The Port of Manchester Warehouses Ltd.



REGISTERED TRADE MARK

CLAYTON

CLAYTON overhead CRANES

THE CLAYTON CRANE & HOIST CO. LTD. (Dept. 16) IRWELL CHAMBERS EAST · UNION STREET · LIVERPOOL 3

Phone: CENtral 1141 (4 lines) *Grams: Claymag, Liverpool*

London Office: 12 Duke St., St. James's, S.W.1. Phone: WHItehall 6988

CEJ CHASER DIES

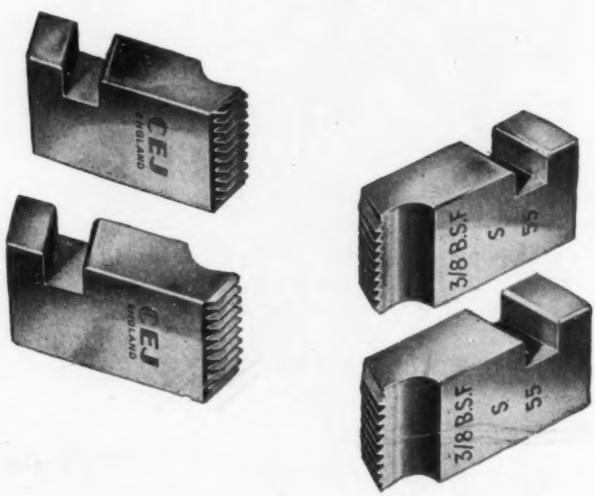
CEJ PRODUCTS

Ground Thread Taps
Screw Plug Gauges
Screw Ring Gauges
Circular Chasers and Holders
Round Dies
Thread Milling Hobs
Thread Rolling Dies
Plain Plug Gauges
Mikrokators
Micro Snap Gauges
Surface Finish Indicators
Micrometers
Bore Gauges
Deltameters (Automatic Sizers)
Drill Chucks
Dynamometers
Extensometers
Plain and Screw Snap Gauges
Plain Ring Gauges
Gronkvist Drill Chucks
Dial Gauges
Tapping Attachments
Multiple Interference Microscopes
Vernier Height Gauges

Everything that care and skill can contribute goes to ensuring that CEJ Dies will be correct in every detail and fully meet your requirements.

They are manufactured from specially selected H.S.S. correctly heat treated; produced by the most exacting methods, rigidly inspected in all thread elements and actually tested before despatch.

CEJ Chaser Dies can be used in CEJ 430 Die Heads and Coventry and similar type Die Heads.



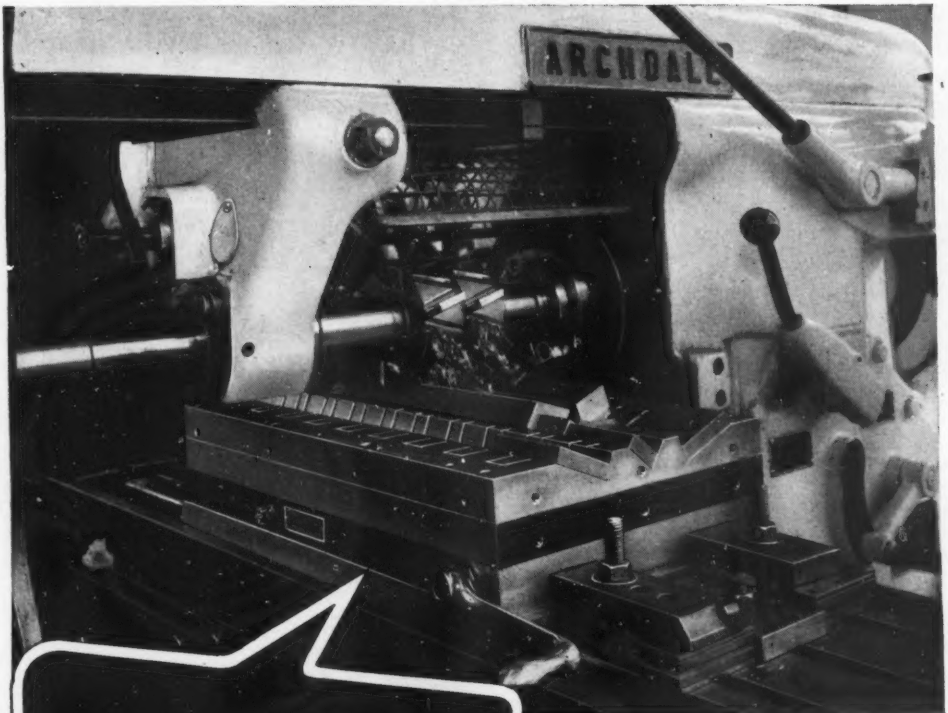
C.E. JOHANSSON LTD.

A.I.D. AND A.P.I. APPROVED

PRECISION TOOLS AND INSTRUMENTS

SOUTHFIELDS ROAD, DUNSTABLE, BEDS. TEL: DUNSTABLE 422-3-4

DBH/5064


ARCHDALE

A FURTHER AID TO CORRECT READING AT NO EXTRA COST

SHARDLOW MICROMETERS

WITH A NEW OBLIQUE LINE SLEEVE TO ELIMINATE ·025" (·5 mm) LINE READING ERRORS
(PATENT APPLIED FOR)

THIS SLEEVE CAN BE PROVIDED ON EXTERNAL AND INTERNAL MICROMETERS OF 1" (25 mm.) CAPACITY.

WHEN ORDERING ADD X TO CATALOGUE NO. TO INDICATE NEW SLEEVE IS REQUIRED.

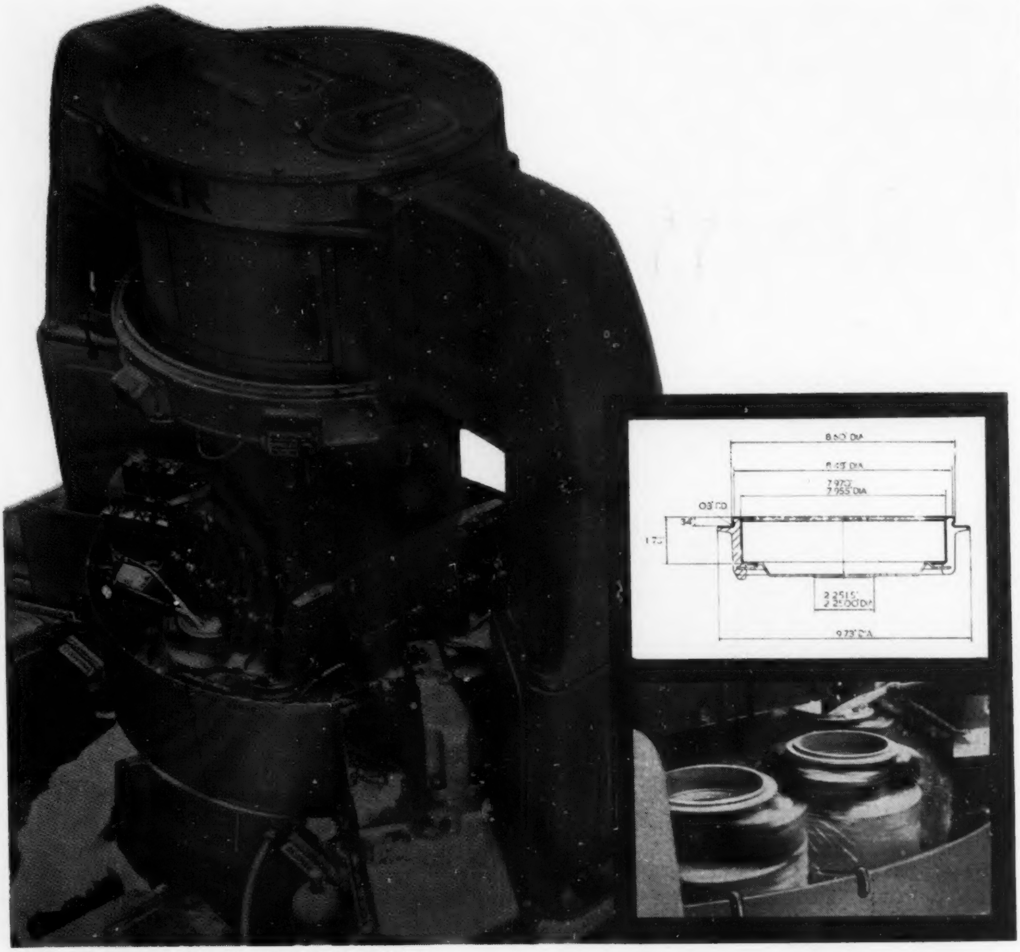
Write for Catalogue of Micrometers & Height Gauges

ASK YOUR MERCHANT FOR DETAILS OR WRITE DIRECT TO

SHARDLOW MICROMETERS LIMITED

PETRE STREET, SHEFFIELD 4

PHONE: 386951/2 **GRAMS: MICROMETERS SHEFFIELD**

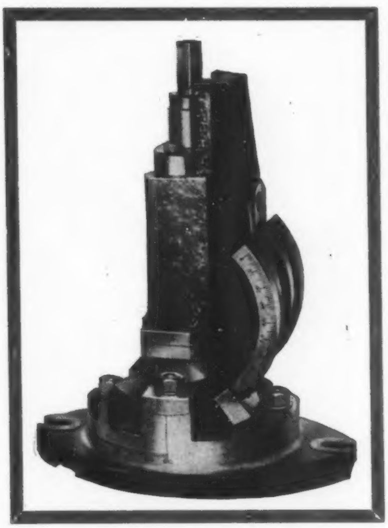


Photograph by permission of Vauxhall Motors Limited

ABWOOD

Vices for Accuracy plus Durability

THE ABWOOD UNIVERSAL MACHINE VICES



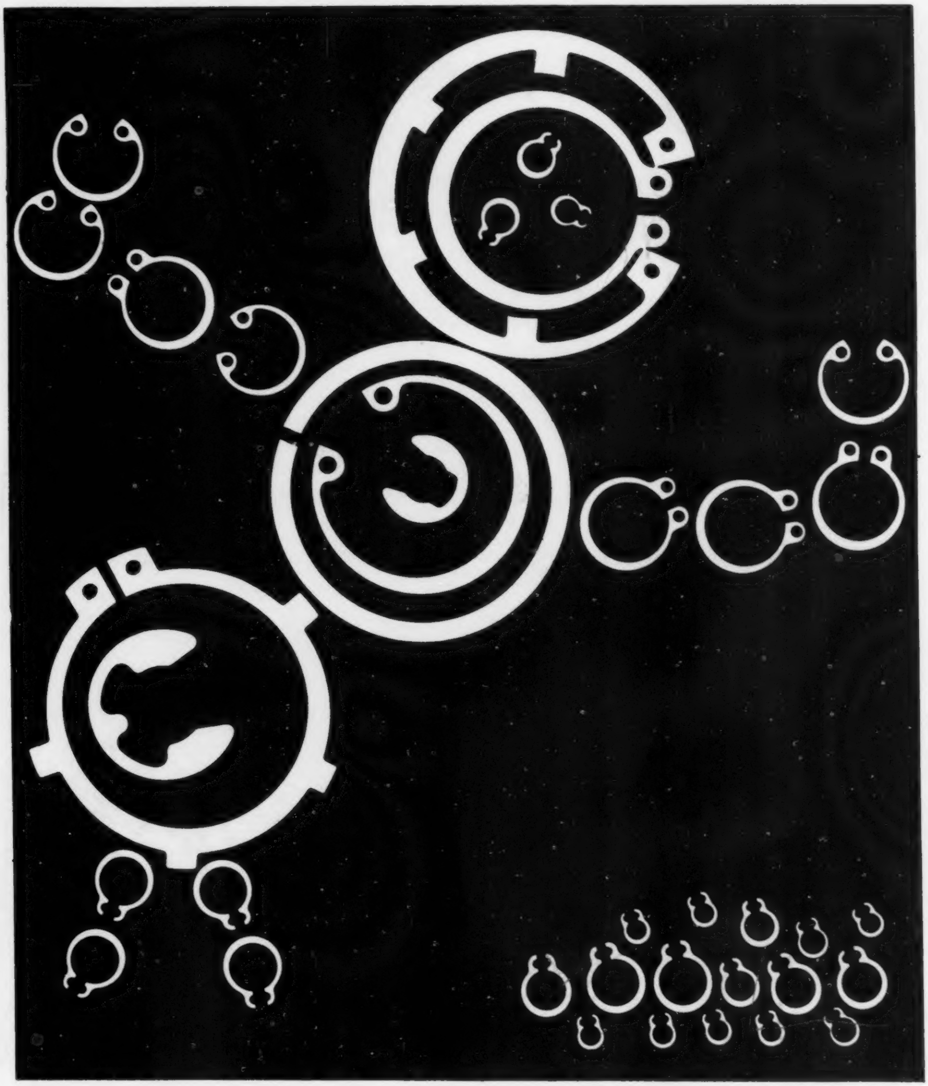
Suitable for jig boring, grinding, milling and shaping machines. Note the clean design, low height, and rigid mounting. The angle cannot alter once the clamps have been locked. Available in two sizes, 4in. and 6in. jaw widths.

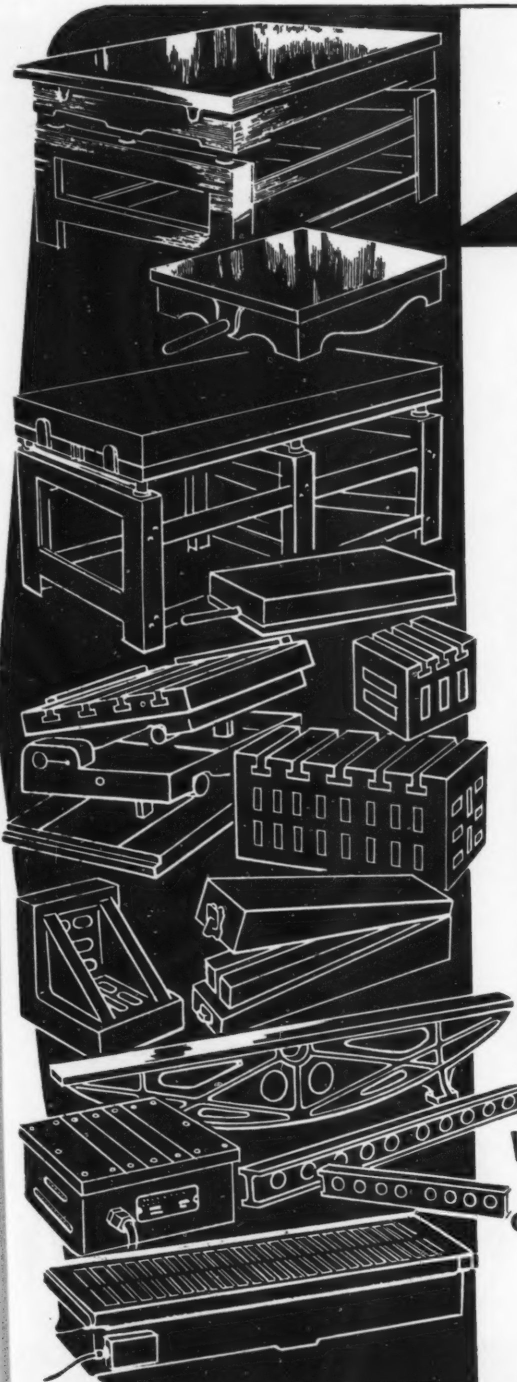
This vice is accurately indexed 0-90° for angular work with spot sight and knife edge for register. The swivel base is indexed through 360° so that any combination of angles may be obtained.

ABWOOD MACHINE TOOLS LTD. PRINCES ROAD, DARTFORD, KENT

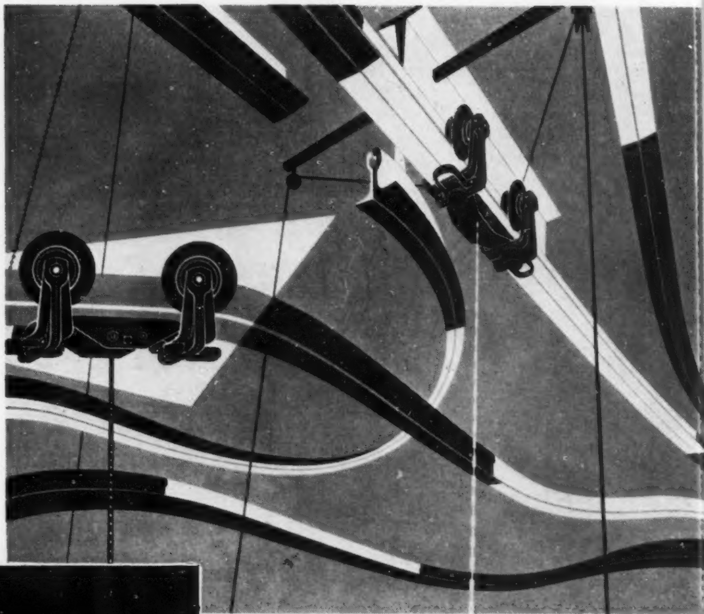
Telephone: Dartford 5271 (5 lines) *Telegrams: ABWOOD, DARTFORD*

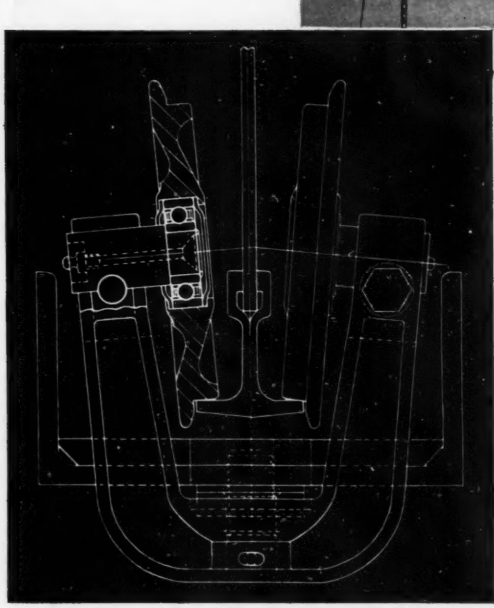
UV-1





SAVING SPACE
SAVING TIME
SAVING EFFORT
SAVING MONEY



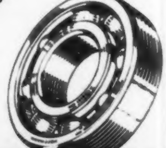


These urgent considerations find a complete answer in the overhead handling systems by British MonoRail Limited of Chadderton, Lancs. We come in on points three and four
To ensure easy rolling and trouble free service wheels are mounted on precision ball bearings. These are practically dust proof and oil tight. Lubrication is rarely required, greatly reducing maintenance costs.

HOFFMANN

BALL AND ROLLER BEARINGS

are world famed for their reliability



THE HOFFMANN MANUFACTURING CO. LTD., CHELMSFORD, ESSEX

You should have heard the boffins on that controversial subject the other day. Old boffin Sid for example.

He was saying that titanium satellites and nimonic space ships were fair game for SKY-ACKY welding.

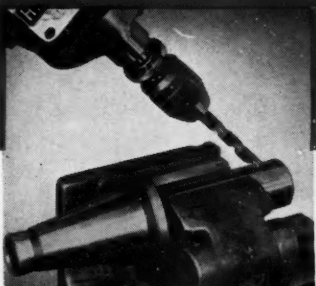
"After all," he said, "saucepans, cages, bicycles, motor cars, missiles and aeroplanes are all SKY-ACKY welded."

"You mean SHE-ICKY welded" squeaked boffin Emanuel. Then all the other boffins joined in: "SHE-ACKY," "SKY-ICKY," "SHI-ARKY," "SKEE-ICKY."

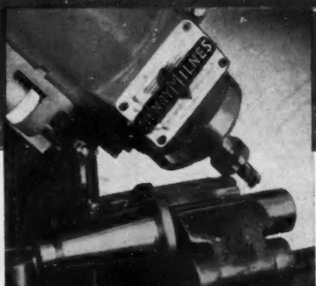
I myself pronounce it *SEE-ACKY*, which is, perhaps, how any self-respecting boffin would pronounce it.

SCIAKY ELECTRIC WELDING MACHINES LIMITED, FALMOUTH ROAD, SLOUGH, BUCKS, ENGLAND. TEL: SLOUGH 25551 (10 LINES) CABLES: SCIAKYWELD, SLOUGH

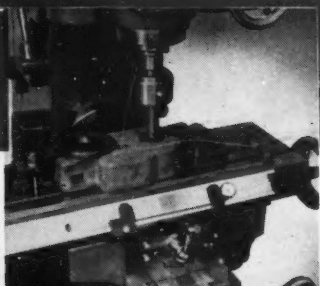
Paris Chicago London Birmingham Manchester Christchurch (N. Zealand) Calcutta Johannesburg Capetown Kuala Lumpur Bombay Bangalore Karachi



ANGULAR DRILLING



ANGULAR END MILLING



BORING

HENRY MILNES LTD., INGLEBY WORKS, ROSSE STREET, BRADFORD, 8, YORKS

ESTABLISHED 1858 *TELEPHONE : BRADFORD 41301*

[illegible] testing machine is operated by [illegible] hydraulics. It is installed at the Rootes Group Ryton factory.

HYDRAULICS IN ENGINEERING

We at Keelavite are a team of experts in the design, installation and maintenance of complete hydraulic systems. We are ready to accept full responsibility for the proper working of all our installations, including all electrical or other control equipment.

Not only this, we are the manufacturers of the largest range of hydraulic units in the United Kingdom.

We are, of course, fully experienced in special applications of hydraulic power for the engineering industry.

KEELAVITE
Hydraulics

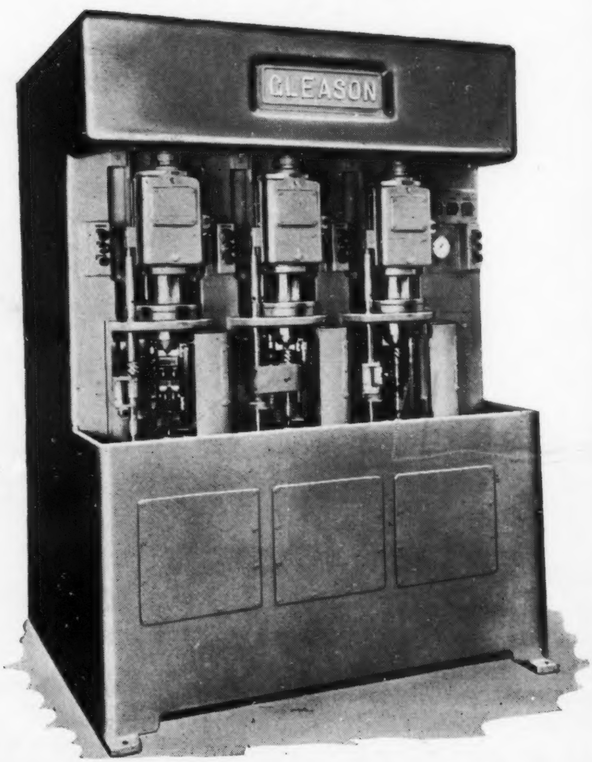
GENERAL ENGINEERING DIVISION

THE RECOGNISED AUTHORITY

KEELAVITE ROTARY PUMPS & MOTORS LTD
ALLESLEY, COVENTRY Telephone: Meriden 441

GLEASON No. 16 PINION QUENCHING MACHINE

for holding and quenching heated pinions
for hardening without distortion
three individual units each of which may be operated separately

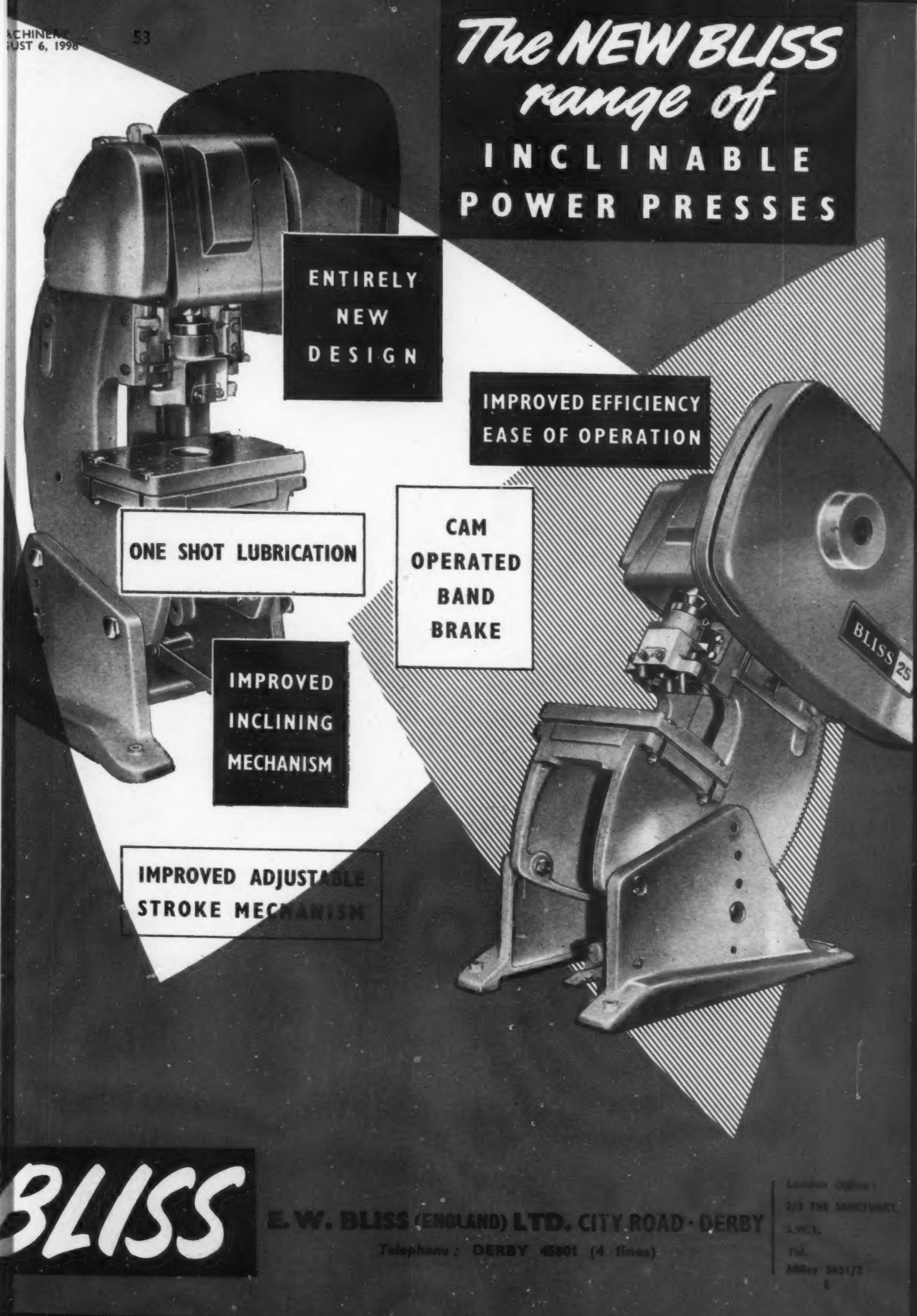


- *completely automatic*
- *automatic straightening*
- *controlled force quench*
- *controlled pressure*
- *built-in pumping system*
- *continual production*

BUCK & HICKMAN LTD

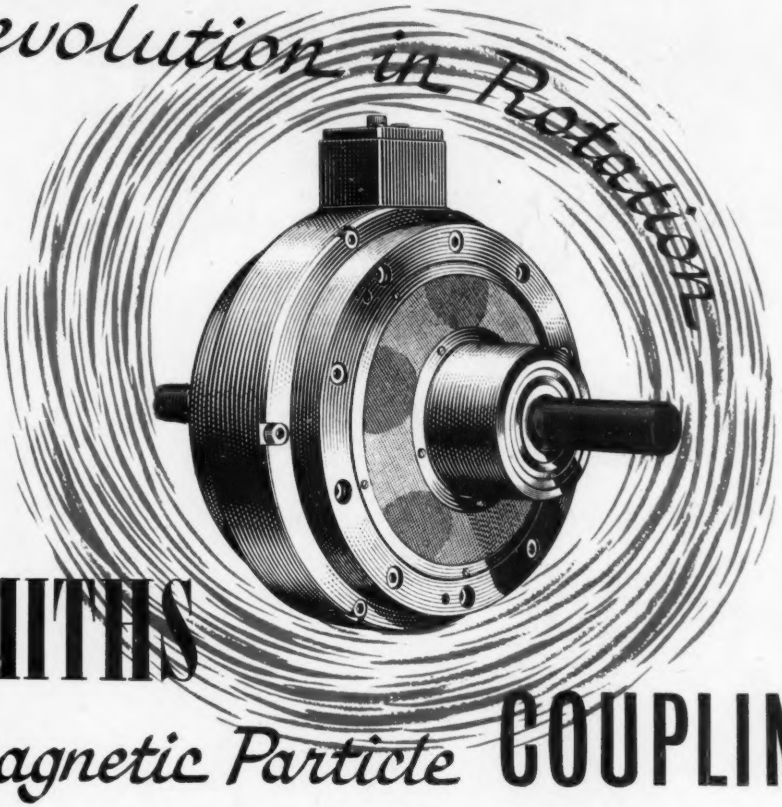
***Head Office**—Whitechapel Rd., London, E.1*
***Machine Tools**—Otterspool Way, Watford by-pass, Herts*
***Branches** — Alperton, Birmingham, Glasgow, Leeds, Manchester*

1958



The NEW BLISS range of
INCLINABLE POWER PRESSES
ENTIRELY NEW DESIGN
IMPROVED EFFICIENCY
EASE OF OPERATION
ONE SHOT LUBRICATION
CAM OPERATED BAND BRAKE
BLISS 25
IMPROVED INCLINING MECHANISM
IMPROVED ADJUSTABLE STROKE MECHANISM
BLISS
E. W. BLISS (ENGLAND) LTD. CITY ROAD · DERBY
Telephone: DERBY 45801 (4 lines)
London Office:
2/3 THE SANCTUARY
S.W.1.
Tel.
ABBey 3651/2

Revolution in Rotation



SMITHS *Magnetic Particle* COUPLING

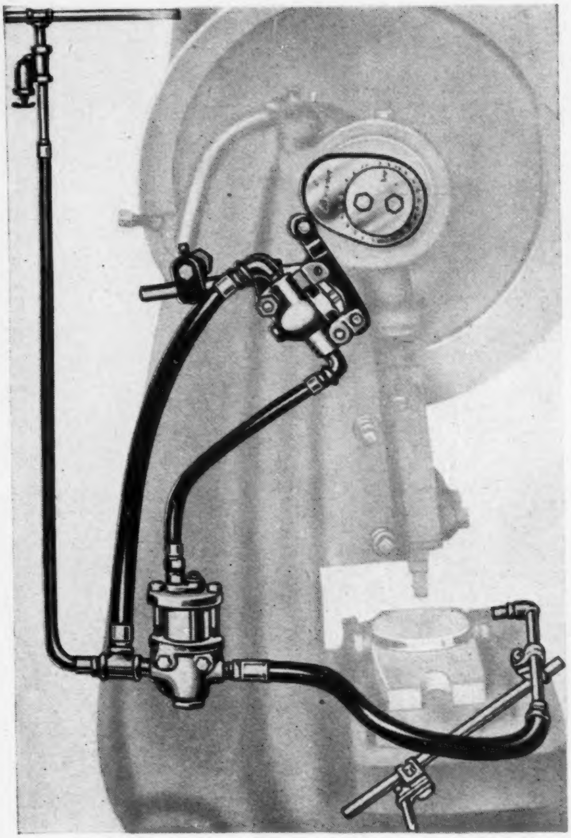
which combines:—**the resilience of the hydraulic coupling and the positiveness of the frictional coupling.** It is revolutionary in that driving and driven elements are coupled by magnetically-activated particles. It has these advantages:—

- Accurate torque control
- No mechanical engagement and thus negligible wear
- Accurate torque limiting slip on overload
- Acts as brake or coupling in **either** direction
- Perfectly smooth operation
- No slip rings—excitation coil is stationary
- Remote control at any distance
- Dynamic and static coefficients of friction equal

The range comprises eight standard units with torque capacities from ⅓ to 200 lb/ft. SMITHS Magnetic Particle COUPLING is unique, its potentialities enormous. Let us advise you, therefore, how best to use it in your particular field.

SMITHS S. SMITH & SONS (ENGLAND) LTD.

INDUSTRIAL PRODUCTS DEPARTMENT, WITNEY, OXON.



AIR EJECTION
gears your production to machine speed

Compressed air scientifically applied to many production problems produces speedier operation and work removal. Schrader Air Ejection Sets are designed to do just that. When fitted to a press or other machine the controlled air blast is synchronized to operate at machine speed, increasing the output and reducing operator fatigue. The pilot valve in the circuit times the duration of the air blast and also its operation at any point of the machine cycle. May we discuss how air ejection will help gear your production to machine speed?

This Air Ejection Set installation shows cam operation off the press crankshaft. It will provide an air blast timed for a fraction of a second, or longer, at any desired point in the press cycle. If required the air blast can be continued after press motion has ceased.

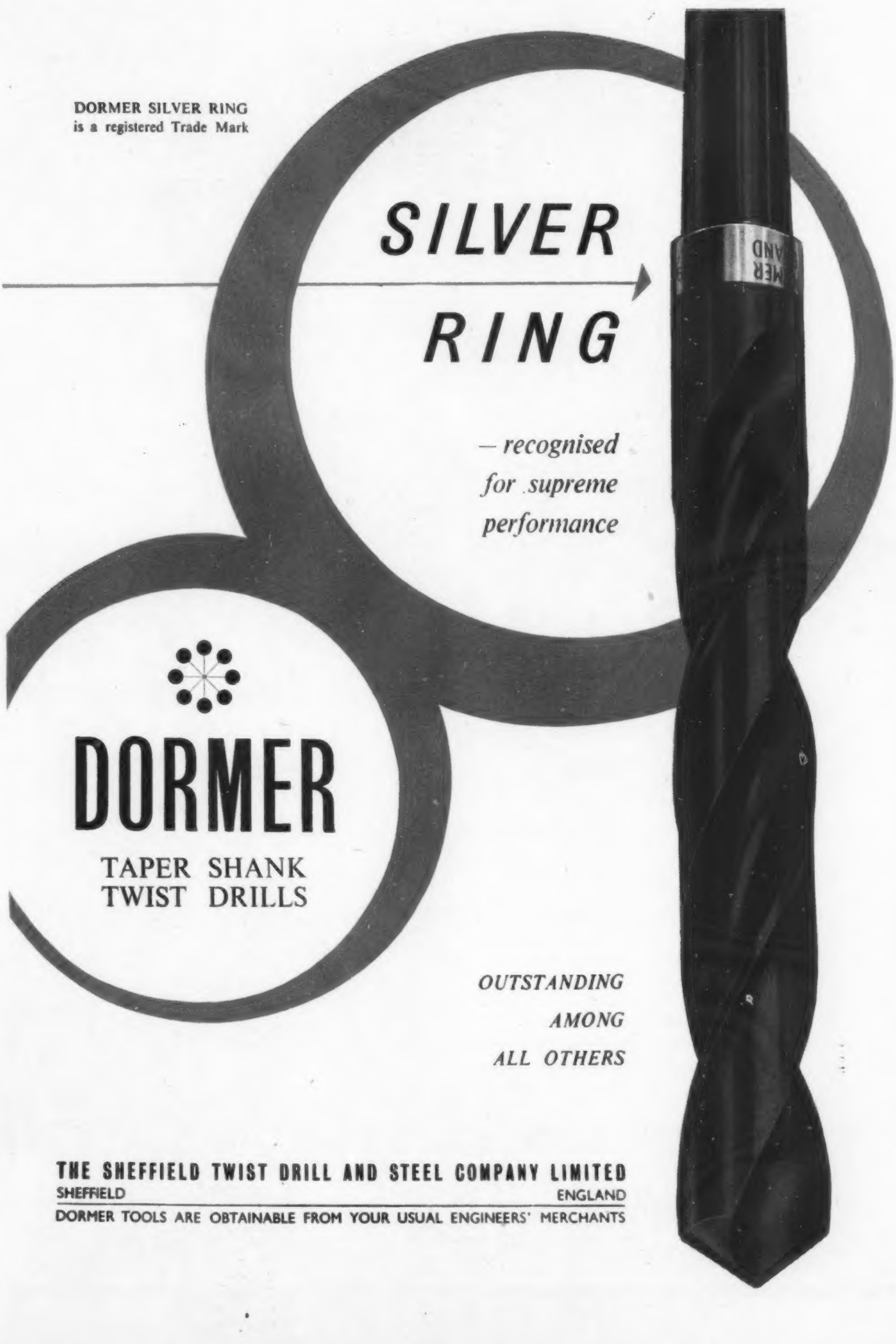
Schrader
AIR EJECTION SETS

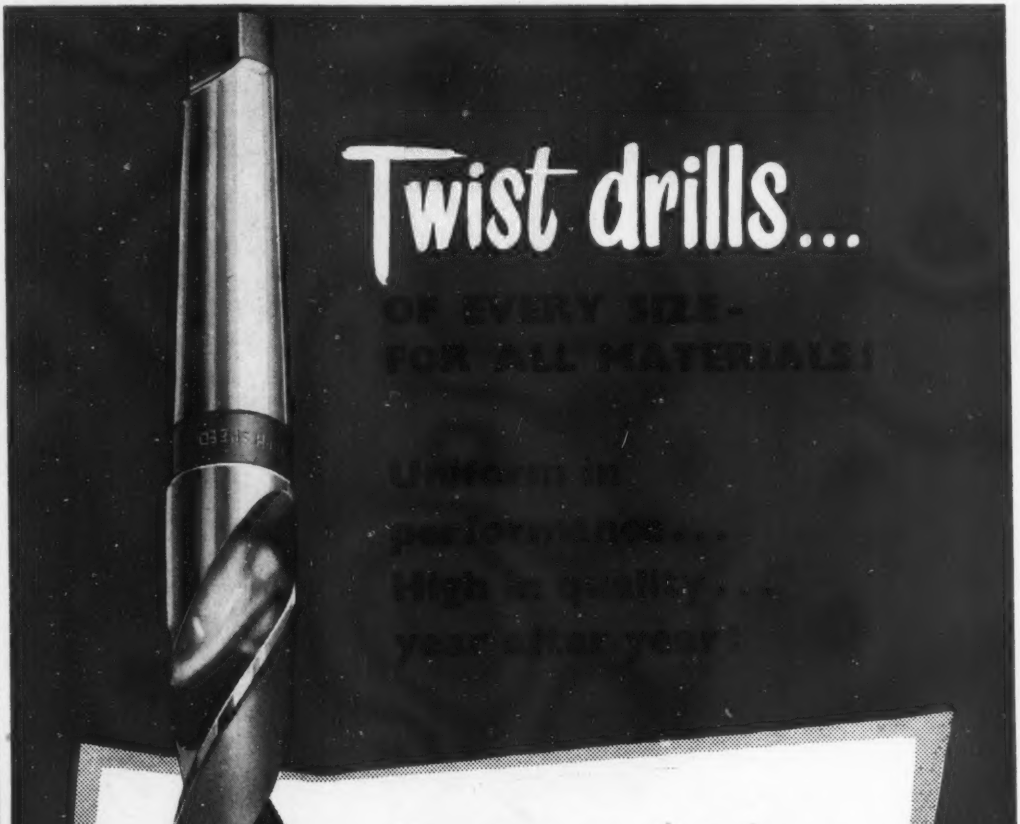
To: **A. SCHRADER'S SON,** Air Control Products Dept. M,
829 TYBURN ROAD, ERDINGTON, BIRMINGHAM, 24
Please send details of Schrader Ejection Sets and Air Control Equipment.

NAME..

ADDRESS..

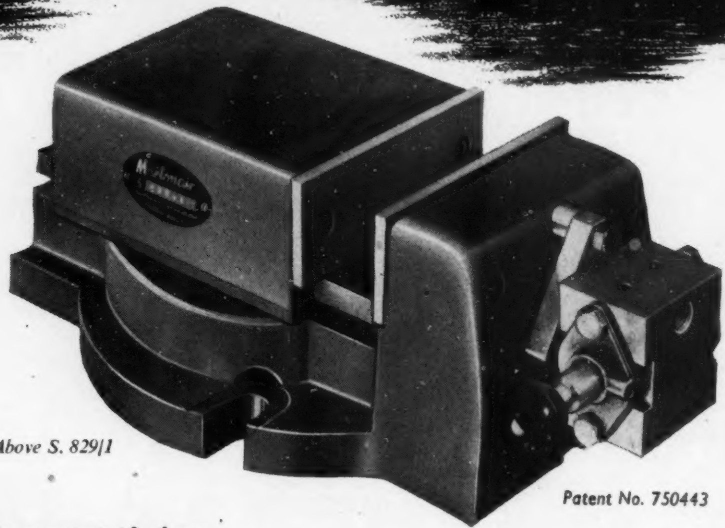
216


DORMER SILVER RING
is a registered Trade Mark
SILVER
RING
– recognised
for supreme
performance
DORMER
TAPER SHANK
TWIST DRILLS
OUTSTANDING
AMONG
ALL OTHERS
THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD ENGLAND
DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS


Twist drills...
OF EVERY SIZE-
FOR ALL MATERIALS!
Uniform in
performance...
High in quality...
year after year!
STALKER
STALKER
THE STALKER DRILL WORKS LTD
DRILL SQUARE, SHEFFIELD 1

MARTON – HARDEN

AIR OPERATED VICE GRIPS – even if air supply fails



Above S. 829/1

Patent No. 750443

**Unlike most air-operated vices, the Marton-Harden vice will not release if the air pressure fails.
Can be used as a hand-operated vice in the event of air failure.
Low height, solid construction.
Push-pull air control valve.**

SPECIFICATION

Width of jaws: $4\frac{3}{8}$in.
Depth of jaws: $1\frac{1}{4}$in.
Overall width: $8\frac{1}{4}$in.
Overall height: $4\frac{3}{8}$in.
Overall length: $13\frac{3}{8}$in.
Net weight: 33 lb.
Maximum capacity: $2\frac{11}{16}$in.
Working stroke: $\frac{1}{16}$in.
Gripping thrust: 2 tons.

Agents and stockists invited

Enquiries to :

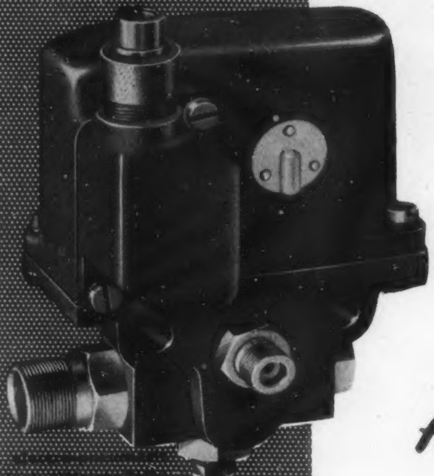
MARTON – HARDEN

MARTONAIR LIMITED

TELEPHONE: RICHMOND 2201 TELEGRAMS: MARTONAIR RICHMOND SURREY

PARKSHOT · RICHMOND · SURREY · ENGLAND

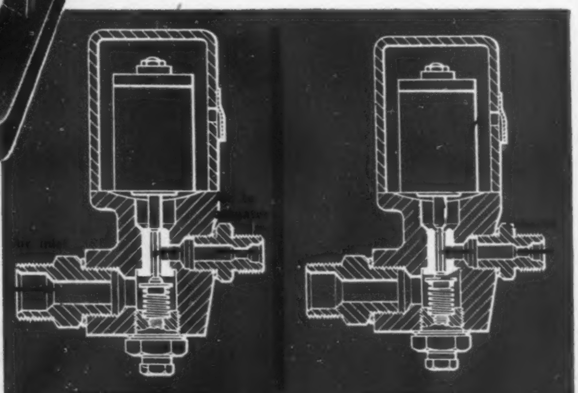
AD 48



Electro-Pneumatic Valves

for Remote Control

For the control of pneumatically operated mechanisms by lightly rated electric switches. A cable carries the electrical control signals, simplifying installation and obviating long airlines. Units are small, compact, low in weight. Particular care has been taken to guard against the ingress of dust, oil, etc., and under test units have demonstrated their complete reliability, performing over one million operations without appreciable wear. Ideal for remote control of actuators, automatic mechanisms, doors, etc. For D.C. operation, in single or multiple units, using air pressures of up to 80 lb/in^2.



The World's Leading Manufacturers of

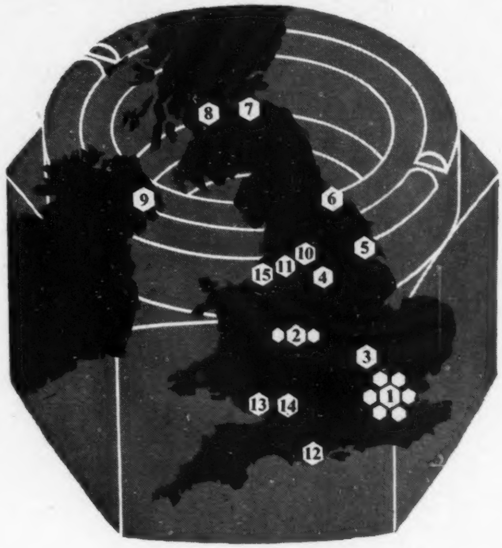
FUEL INJECTION & ELECTRICAL EQUIPMENT

C.A.V. LIMITED, ACTON, LONDON, W.3.

AP 899


SUPER 18
F.M. PARKIN (SHEFFIELD) LTD. ENG
FMP 808 COBALT
455 COBALT
FMP TRIPLE 5C
★ HIGH SPEED STEEL
FMP
TOOL BITS
FOR IMPROVED PERFORMANCE ON ALL MACHINING OPERATIONS
SQUARES
ROUNDS
FLATS
TRIPLE 5C
FOR NIMONIC AND HIGH TENSILE STEELS.
TERMS TO STOCKISTS DEALERS AND IMPORTERS
ALSO FORM TOOL TO CUSTOMERS' SPECIFICATIONS
HEAD OFFICE
F. M. PARKIN (SHEFFIELD) LTD.
ST. THOMAS STEELWORKS,
SHEFFIELD, 8, ENGLAND
AGENTS and REPRESENTATIVES

Appointed Stockists of NYLOC, FIBRE & PINNACLE self-locking nuts—the modern method of safe assembly



1 THE ALDER HARDWARE & ELECTRICAL CO. LTD., 199 New King's Road, Fulham, LONDON, S.W.6.
Telephone: Renown 6421. P.B.X.

LEWIS HUNTER & CO., 25 Laurence Pountney Lane, Cannon Street, LONDON, E.C.4.
Telephone: MINcing Lane 8805 and 9082.

H.S.S. LTD., 25 Church Road, TEDDINGTON, Middlesex.
Telephone: Molesey 4441-5.

H.S.S. LTD., Cox Lane, CHESSINGTON, Surrey.
Telephone: Lower Hook 1005-9.

F. MILLER & CO. (LONDON) LTD., Rectory Road, Acton, LONDON, W.3.
Telephone: Acorn 5201. P.B.X.

F. MILLER & CO. (LONDON) LTD., Cambridge Avenue, SLOUGH, Bucks.
Telephone: Slough 25511 (10 lines).

TELCO LTD., 3 Newman Street, LONDON, W.1.
Telephone: MUSeum 5701 (4 lines).

2 W. H. & G. WALKER & CO., 11 Edward Street, Parade, BIRMINGHAM 1.
Telephone: CENtral 0575.

G. F. BRIDGES LTD., 63 Snow Hill, BIRMINGHAM 4.
Telephone: CENtral 3911 (5 lines).

3 RANDALLS LTD., 20-22 St. Mary Street, BEDFORD.
Telephone: Bedford 67488.

4 THE NEEDHAM ENGINEERING CO. LTD., P.O. Box No. 23, Townhead Street, SHEFFIELD 1.
Telephone: Sheffield 27161 (10 lines).

5 THE HULL FACTORING CO. LTD., 227-229 Anlaby Road, HULL, East Yorkshire.
Telephone: 36725 (3 lines).

6 MACNAYS LTD., G.P.O. Box 14, MIDDLESBROUGH, Yorks.
Telephone: Middlesbrough 45111 (7 lines).

7 D. F. WISHART & CO. LTD., P.O. Box No. 74, 18 Picardy Place, EDINBURGH, 1.
Telephone: Waverley 1444 (5 lines).

8 LAND, SPEIGHT & CO. LTD., 2 Fitzroy Place, Sauchiehall Street, GLASGOW, C.3.
Telephone: Central 1082-3.

9 KENNEDY & MORRISON LTD., 12 Library Street, BELFAST.
Telephone: Belfast 30231 (5 lines).

10 SMITH, NICHOLSON & WEST LTD., P.O. Box No. 10. Gaol Lane, HALIFAX.
Telephone: Halifax 5757 (6 lines).

11 J. A. CHALLINER & CO. LTD., 77-83 Downing Street, MANCHESTER 1.
Telephone: ARDwick 3221-2-3.

12 J. R. SMITH & SONS (STRUCTURAL) LTD., Hamworthy, POOLE, Dorset.
Telephone: Poole 1300 (7 lines).

13 JOHN HALL (TOOLS) LTD., 23 Churchill Way, CARDIFF and all branches.
Telephone: Cardiff 22242 (7 lines).

14 WOODBERRY, CHILLCOTT & CO. LTD., 122 Victoria Street, BRISTOL 1. G.P.O. Box 236.
Telephone: Bristol 26524 (6 lines).

15 TOM WALLACE (LIVERPOOL) LTD., Hope Street, LIVERPOOL 1.
Telephone: Liverpool Royal 6401 (5 lines).

TOM WALLACE (LIVERPOOL) LTD., 52 Cleveland Street, BIRKENHEAD.
Telephone: Birkenhead 3434.

Merchant enquiries to nearest Stockist please!

SIMMONDS AEROCESSORIES LIMITED

TREFOREST, PONTYPRIDD GLAMORGAN

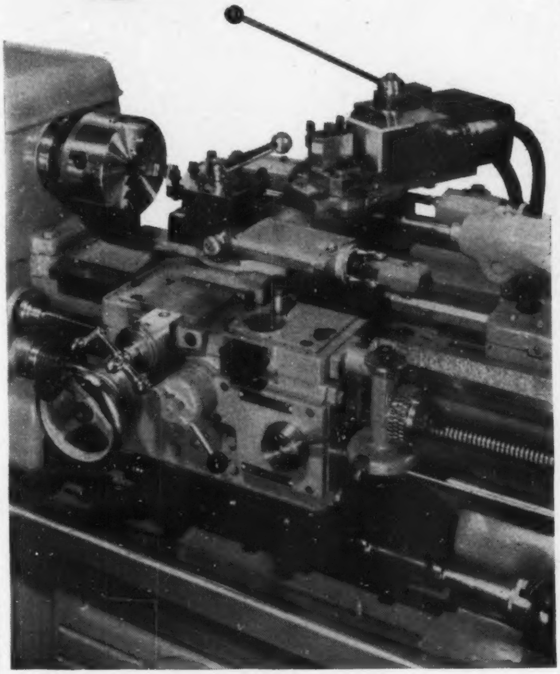
Branches: London, Birmingham, Manchester, Glasgow, Stockholm, Copenhagen, Ballarat, Sydney, Johannesburg, Naarden, Milan and New York

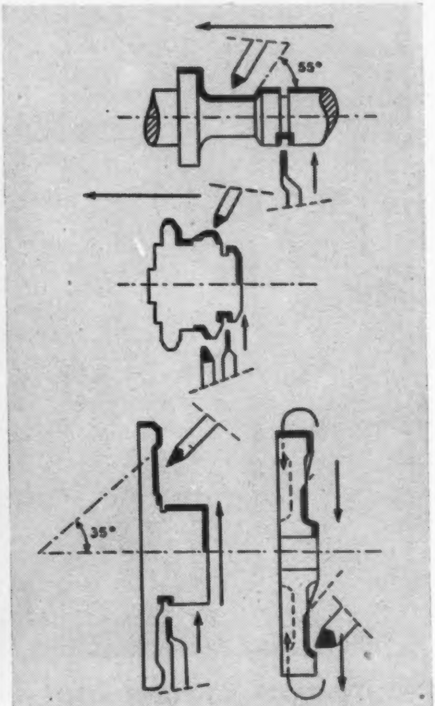
A MEMBER OF THE FIRTH CLEVELAND GROUP

CRC 37N


ACCURACY . .
·0002 in. makes a great deal of difference in the machine shop where a smudged or inaccurate layout can mean disaster—yet a film of SPECTRA-COLOR only that thickness will eliminate all doubts. It dries instantly and cannot smudge, chip, peel or crack—what is more, it is unaffected by oil, water or petrol. With SPECTRA-COLOR you *must* get needle sharp lines, permanently bright—there until machined off or removed with SPECTRA-REMOVER. There are two grades, in Standard for all bright metals and in Opaque for black metals and unmachined castings, both in 13 colours.
No need to look for a brush—we can supply that too—¾" only—just ask for SPECTRA BRUSHES
SPECTRA COLOR
BLUE
SPECTRA-COLOR
NEEDLE-SHARP LAYOUTS—INSTANT IDENTIFICATION

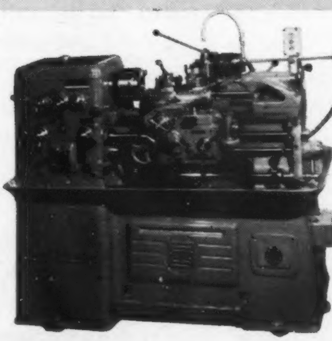
for versatility in Copy Turning





Direction of arrows indicate direction of feed.

The HEB type HN and AC lathes with built-in hydraulic copying units may be employed on either longitudinal or transversal copying. The square turret may be used in conjunction with the copying unit or for normal lathe work. The position of the copying unit and its angle can be set to suit the size or form to be machined as shown in the diagram of work examples above. Maximum piston stroke is 3in. for the AC machine and 3¼in. on the HN type. Copying length is 16½in. and 39in. respectively and maximum swing over cross slide from 5⅜in. on the AC up to 12¼in. on the largest HN type. These lathes can be used for all normal S.S. & S.C. lathe work and can be supplied with or without screwcutting equipment.



Sales & Service for . . . **DRUMMOND-ASQUITH** *. . . the British Isles*

DRUMMOND-ASQUITH (SALES) LTD., KING EDWARD HOUSE, NEW ST., BIRMINGHAM

'Phone: Midland 3431 (7 lines) 'Grams: Maxishape, B'ham. Also at LONDON: Phone: Trafalgar 7224 (5 lines) and GLASGOW: 'Phone: Central 0922

1F292

MACHINERY is registered as a newspaper at the General Post Office and the name is a registered trade mark

Published every Wednesday by
The Machinery Publishing Co., Ltd.

Price 1/3

•

LESLIE R. MASON
Managing Director

CHARLES H. BURDER
Editor

•

EDITORIAL OFFICE

REGISTERED OFFICE, SMALL AND CLASSIFIED ADVERTISEMENTS DEPARTMENT AND ENQUIRY BUREAU

CLIFTON HOUSE
83-117 EUSTON ROAD
LONDON, N.W.1.

Telephone: Euston 8441/2
Telegrams: Machtool, Norwest, London

•

HEAD OFFICE

SUBSCRIPTION, ADVERTISEMENT, SERVICE, PHOTOGRAPHIC, ACCOUNTS AND BOOK DEPARTMENTS

NATIONAL HOUSE
21 WEST STREET
BRIGHTON, 1.

Telephone: Brighton 27356 (3 lines)

Telegrams: Machtool, Brighton

NEW YORK: 93, Worth Street

PARIS: 15, Rue Bleue

•

CONTRIBUTIONS:—If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining, or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, or utilizing supplies, send it to the Editor.

Short comments upon published articles and letters on subjects concerning the metal working industries are particularly welcome. Payment will be made for exclusive articles.

SUBSCRIPTIONS:—Inland and overseas, 52 shillings per annum, post free. Cheques and Money Orders should be made payable to the Machinery Publishing Co., Ltd.

ADVERTISEMENTS:—Copy for displayed advertisements, if proofs are required, should reach the Brighton office 21 days in advance of publication. Rates on request.

Small (classified) advertisements can be accepted, space permitting, at the London office up to first post Thursday, for publication on the following Wednesday. For rates, see p. 111.

Blocks are held at advertisers' own risk; no responsibility for loss is accepted by the publishers.

MANUSCRIPTS FOR BOOKS covering all branches of engineering production will receive careful consideration and should be sent to the Manager, Book Dept., MACHINERY, National House, 21 West St., Brighton, 1.

MACHINERY

A JOURNAL OF METAL-WORKING PRACTICE AND MACHINE TOOLS

Vol. 93, No. 2386 August 6, 1958

COPIES PRINTED.................................11,500 per week

CERTIFIED DISTRIBUTION....................11,376 per week

CERTIFIED PAID DISTRIBUTION...........10,566 per week

CONTENTS

Abstracts of Principal Articles

Aspects of Russian Engineering Industry P. 286

This article, the third in a series concerned with the engineering industry of the U.S.S.R., is devoted to the Sverdlov Machine-tool Plant, Leningrad, and the machine tools built therein. The plant builds a range of medium and heavy-duty horizontal boring machines, 3-dimensional profile milling machines and special purpose equipment, mainly for heavy industry. Recently, a programme control system has been developed in the plant, whereby co-ordinate settings can be made by "dialling" or from punched cards. This system has been applied to horizontal boring machines, and to a large jig-boring machine which is now in series production. The latter machine is of the portal type, with horizontal and vertical cutter heads, and it is stated that co-ordinate settings can be made to an accuracy of 2 microns (0·00008 in.). (MACHINERY, 93—6/8/58.)

Automation Applied to Small-batch Production .... P. 301

A line of three Kearney & Trecker machines installed in one of the plants of the Hughes Aircraft Co., U.S.A., is operated by the Digitape control system developed by the latter company. Intended for the production of parts in small batches, or even singly, the installation is so arranged that four different components may be in progress at any time, fixtures containing these parts being passed down the line in succession. One punched tape provides for all the operations on a given part and there are four tape readers. The first machine in the line enables milling operations to be performed in three directions at right angles. On the second machine there is an indexing turret which will accommodate a maximum of 20 different tools. These tools are brought to the operating position automatically and the quills are guided on an outboard support. There are two boring spindles on the third machine, one of which can be adjusted automatically for hole diameter. (MACHINERY, 93—6/8/58.)

Peenamatic Shot Peening Machine for Forming Integrally-stiffened Wing Panels P. 311

Supplied by the Metal Improvement Co., U.S.A., to the Boeing Airplane Co., the machine described has a capacity for handling wing panels up to 84 ft. long by 7 ft. wide, and skin thicknesses up to ⅝ in. can be treated. The stationary work table is inclined at 30 deg., in the transverse plane, to facilitate recovery of the spent shot. Peening carriage traverse speed may be steplessly varied from 6 to 60 in. per min. Ten nozzles are adjustably mounted on a carrier which is reciprocated transversely while the operation is in progress. To enable the curvature of the work surface to be controlled, provision is made for adjusting the air pressure, and consequently the peening intensity, for each nozzle independently. (MACHINERY, 93—6/8/58.)

Ultra-precision Grinding of Small Cylindrical Parts .... P. 313

With the aid of equipment here described, plungers for fuel injection systems are ground to a close fit for the cylinders on a Brown & Sharpe No. 5 plain machine. Setting for parallelism is made with the aid of an Electralign instrument for electronic alignment of the swivel table. For accurate size control an electronic caliper gauge is employed in conjunction with Ceda/Size equipment which provides a very fine feed of millionths of an inch per work revolution during the final stage. When mating parts are being ground, the equipment is used in conjunction with an Electromate attachment which incorporates a "computer-selector" unit. It is stated that clearance between piston and bore can be held within $\pm 0{\cdot}00002$ in. provided that the bore sizes do not vary by more than 0·0002 in. on diameter. (MACHINERY, 93—6/8/58.)

Kendall & Gent 300-ton Plano-milling Machine .... P. 315

The machine here described has been installed in the Larne works of the British Thomson-Houston Co., Ltd. It has a capacity for work up to 29 ft. 9 in. by 12 ft. by 8 ft. 6 in. high. There are two vertical milling heads, each driven by a 60-h.p. variable speed motor, and provision has been made for fitting a horizontal milling head, if required. An Asquith drilling and boring head is mounted at the rear of the cross rail, so that various operations can be carried out on large workpieces with a minimum of handling. Feed rates for the table and milling heads range from ½ to 24 in. per min. (MACHINERY, 93—6/8/58.)

Investigation of Chatter on Radial Drilling Machines .... P. 317

It is pointed out in this article that chatter is normally induced as a result of vibration generated directly by machining. Attention is then drawn to two methods of vibration testing of drilling machines, one of which involves drilling under closely controlled conditions, and the other, the application of artificial loads by means of an electromagnetic vibration generator. The design and application of a suitable generator are briefly discussed, and vibration measurement and modes of vibration in radial drilling machines are then considered. Finally it is explained how this information may be applied to modify machine designs and to avoid operating conditions which are known to produce instability. In conclusion it is pointed out that the simulated tests with a vibration generator enable the effects of a wide range of frequencies to be rapidly investigated. (MACHINERY, 93—6/8/58.)

IN FORTHCOMING ISSUES

Aspects of Russian engineering industry—The Triulzi factory for die casting and injection moulding machine production.

Developments in Tool Servicing Arrangements

Cemented carbide cutting tool materials of various grades are now very widely employed and it seems probable that tools of ceramic—or sintered oxide as it should, perhaps, preferably be termed—will find rapidly increasing application in the future. The basic advantages of these materials are, of course, that they offer high heat and wear resistance, and when they are employed under suitable conditions, rapid metal removal rates can be obtained on the one hand, while, on the other, close dimensional limits can often be maintained over comparatively long runs. In this connection, however, it should be borne in mind that because very high cutting speeds are possible with the newer materials, and may even be essential for their satisfactory performance, a considerably increased length of run, expressed in terms of the number of components machined, may, in fact, be completed in less time than the former, shorter, run that was obtained with the tools previously employed. In other words, if the latest types of cutting tools are being used to the best advantage, when all factors are taken into account, it does not follow that their adoption will necessarily decrease—indeed it may possibly increase—the number of times that servicing is required per shift or per week.

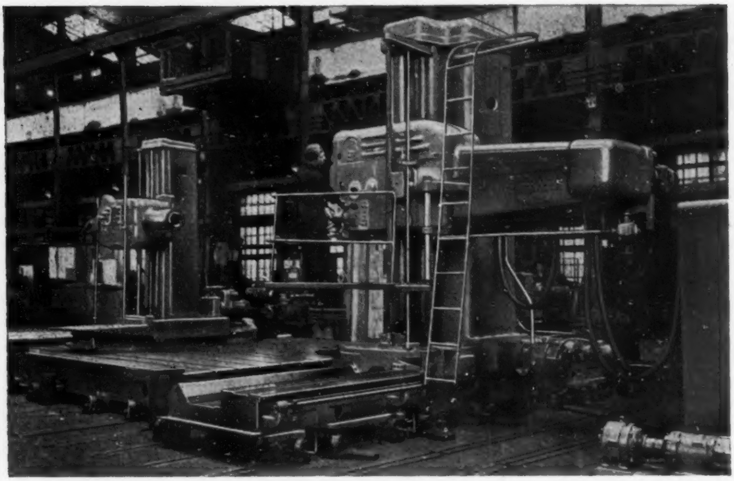
The newer tool materials, as is well known, are much more sensitive to operating conditions than is high-speed steel, for example. They are, perhaps, even more sensitive to servicing methods, and unless re-sharpening is carried out in such a manner that the material is not adversely affected, and the required geometry and surface finish are consistently obtained, optimum tool life and work quality cannot be expected. At the same time, it is becoming increasingly important that the time during which a machine is idle while one or more tools are being replaced should be kept to a minimum. Obviously, the shorter the machining cycle, the greater is the loss of output when the operation is interrupted for a given period.

One method of simultaneously ensuring consistent servicing and reducing idle time is to employ clamped, "throw-away," tips of carbide or ceramic. The advantages of such tips have frequently been discussed, and it appears that they have found wide and constantly increasing application, particularly in the U.S.A., not only for single-point turning tools, but also for milling and boring operations. In the circumstances the apparent lack of enthusiasm of many British manufacturers towards this development is difficult to understand. Such tools, it might be thought, should be of special interest to smaller firms which have not hitherto employed carbide—or sintered oxide—because they have been reluctant, or unable, to provide the necessary grinding and lapping equipment for servicing on the very limited scale that would be involved.

Where throw-away tips are unsuitable or are not yet being employed, the user of carbide or sintered oxide is now afforded a considerable choice of equipment whereby correct sharpening of tools is greatly facilitated. For example, in addition to conventional grinding and lapping machines of the face-wheel type, with provision for accurate control of angle, there are machines which provide for simultaneous rotary and oscillating motions, or reciprocating motions only, in one or two directions. Mention may also be made of abrasive band type equipment, and spark erosion machines which are claimed to avoid the formation of incipient cracks in the tool material.

Proper tool sharpening is an essential part of an effective servicing system, but there are two other aspects which are of almost equal significance. If the best results are to be obtained as regards both work quality and tool life—where tools are to be re-sharpened—it is essential that the tools should be removed from machines for servicing at regular intervals to avoid the destructive effects of continued operation after the edges have become dulled. Depending on the complexity of set-ups or installations, various arrangements may be adopted to ensure systematic tool replacement. For use with elaborate transfer machines, the value of dials which indicate when individual tools have completed their allotted numbers of operations has been fully established. It is a simple matter, moreover, to arrange for the machine to be automatically stopped for tool changing so that the dials need not be kept under frequent observation. As a contribution to the attainment of maximum quantity and quality of output, it may well prove desirable in the future to employ such tool control boards on an increasing scale for other types of machines, notably multi-spindle automatics and multi-tool lathes.

(*Continued on page* 334)



Aspects of Russian Engineering Industry

Some Impressions Based on a First-hand Study of Soviet Plants

Earlier articles in this series* on some aspects of the engineering industry in the U.S.S.R. were concerned with the growth of the Russian machine tool building facilities, and some recent Soviet machines were described and illustrated. The Ordzonikidze Machine Tool Plant, in the suburbs of Moscow, was considered in some detail, and it may be recalled that this plant is engaged in the building of multi-spindle automatics and hydraulic copying lathes, also in the design and construction of special-purpose and automatic transfer machines. Another Soviet machine tool plant will now be described, namely, the Sverdlov works, in Leningrad, where boring machines and special-purpose equipment are built.

SVERDLOV MACHINE TOOL WORKS

The Sverdlov Machine Tool Works is stated to be the longest-established plant for building machine tools in the Soviet Union. Before the revolution, there was an engineering factory on the present site, owned by a German company. This factory was engaged principally in the production of diesel engines, but some machine tools were built. It was closed down in 1917, and did not re-open until 1925, when it was planned to specialize in the building of metal-working equipment. Initially, the output consisted solely of lathes, but since that time, many different types of machines have been built, including shapers, boring machines, polishing machines and special-purpose units. In 1932, the decision was made to concentrate mainly on the construction of boring and copy-milling machines, although the building of other types of metal-cutting equipment was also undertaken. During the second world war, the plant continued to build machine tools, until it was demolished by eight direct hits during bombing raids. Every effort was made to rebuild the works as quickly as possible, reconstruction proceeding shop by shop, and, before the end of the war, production was resumed.

Some 2,500 people are now employed at the Sverdlov plant, and the technical, engineering and design staff total 500. More than 30 per cent of the latter are women, the greater proportion of whom are designers or technologists. Many of the designers and engineers have been working at the plant for 15 to 30 years, and the chief engineer started at the plant as a turner, 30 years ago, pursuing his technological studies in his spare time. A close connection has always been maintained between the Sverdlov plant and the Leningrad Special Technicum for Machine Tools, and it may be of interest to note that the principal of this technicum, Professor Sukolov, started his career as a bench hand at the plant.

* MACHINERY, 93/4–2/7/58, and 93/137–16/7/58.

The Sverdlov works has a very strong technical team, which includes four Candidates of Technical Science—a qualification that ranks immediately below a Doctor's degree—and the overall experience of this team is very wide. Liaison is maintained with the various Soviet machine-tool research institutes, such as ENIMS, and these institutes collaborate with the plant to solve any particularly difficult design problems. It is stated that the design and technical staff of the plant seldom have to call on outside help, and, in many instances, assist the institutes in their work.

All the design and development work associated with machine-tool building is carried out by the plant's own staff. There are four design offices, all equipped with draughting machines, each office specializing in a particular field of design, namely, boring machines, milling machines, automatic and special machines, and electrical systems. These offices are served by a separate calculations bureau. From 30 to 35 different types or sizes of machines are built each year, including special machines for the production of turbines and equipment for the heavy industries. Since 1945, the output of the plant has been increased by approximately 24 times, as indicated by the chart, Fig. 1. This expansion has been brought about by the introduction of new and more efficient equipment and methods, and improvement in labour efficiency, as can also be seen from the chart. In the future, it is planned to increase output by 12 to 15 per cent each year. At present, about 15 per cent of the production of the plant is being exported to such countries as Finland, Switzerland, India and Japan, in addition to China and other countries in the Soviet *bloc*.

A large number of the machines in the plant are of American or British origin, but these units are gradually being replaced by Russian-built equipment. Some of the older foreign machines have been modernized. Generally, the amortization period for equipment is eight to ten years, but last year some 60 lathes were replaced which were only about five years old, since greatly improved types had become available. Finance for the provision of new equipment is obtained from two sources. One, is by borrowing from the State bank, which advances loans over a period of two years without interest. The other source is the "director's fund." In common with other Soviet plants, the Sverdlov works pays a fixed proportion of its annual profit to the state. The remainder forms the director's fund, and is used by the plant for the purchase of new equipment, improvement of the housing facilities provided by the plant, and for the betterment of the working conditions and amenities. In a well-run plant, it is stated, about 40 per cent of the director's fund is used each year for the purchase of new production equipment. During 1957, the Sverdlov works was able to transfer 1,600,000 roubles to the director's fund, of which 300,000 roubles was devoted to housing and improving working conditions, and the remainder was spent on new equipment.

The plant occupies an area of about 740 acres. There is an extensive main production shop, which is divided into three bays, one for machining spindles and smaller details, another for operations on heavy castings, and the third for machining castings of medium size. The plant has its own foundry for small castings, but, at the time of our visit, all other castings were obtained from outside sources. A large conveyorized foundry is to be laid down next year. A unified system of machine construction is applied wherever possible, with components that are common to a number of machines, and it is claimed that, generally, about 80 per cent of the parts used on any one machine are also used on other machines built by the plant.

BORING MACHINE DESIGNS

As has already been intimated, by far the greater proportion of the output of the Sverdlov plant consists of horizontal boring machines. The type 262G was introduced in 1946, and has been in full production for the past ten years. It is of conventional design, and, like all Russian horizontal boring machines, has the headstock at the right-hand end

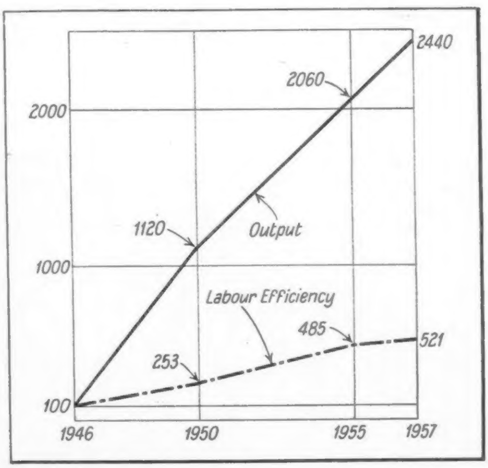


Fig. 1. Increases in Output and Labour Efficiency at the Sverdlov Machine Tool Works, Leningrad, during the Post-war Years, are Indicated by these Graphs

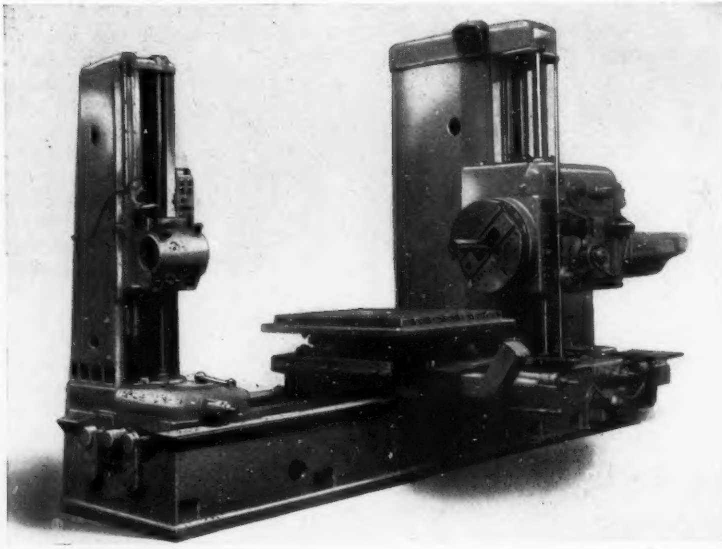


Fig. 2. The Sverdlov Type 2620A Medium-duty Horizontal Boring Machine, which will be the only Medium-duty Design Built by the Plant after the end of this Year

of the bed, as viewed from the front. The machine table measures 1,000 by 800 mm. (40 by 35 in. approximately), and the main spindle is of 85 mm. (3·346 in.) diameter. Spindle speeds range up to 1,000 r.p.m., and the facing slide has a maximum travel of 150 mm. (5·9 in.). Two other horizontal boring machines have been developed from this basic type, one of which—the type 262D—has a spindle of 110 mm. (4·331 in.) diameter, without a facing slide, but is similar in all other respects to the earlier machine. The 2621 boring machine, is similar to the 262G type, but has a maximum spindle speed of 2,000 r.p.m., and no facing slide, and production of this machine started in 1950. About 70 per cent of the plant's current output of 350 medium-duty boring machines per year consists of these three types, the remainder comprising the latest design, type 2620A.

Shown in Fig. 2, the type 2620A was introduced early this year, and next year the plant will only build this one type of medium-duty machine. It has a main spindle of 90 mm. (3·543 in.) diameter, which is bored No. 5 Morse taper, and the maximum axial travel of the spindle is 710 mm. (27·953 in.). The face-plate is 625 mm. (24·606 in.) diameter, and has a facing slide with a maximum travel of 170 mm. (6·693 in.). To ensure long working life, the boring spindle is nitrided, and runs in precision roller bearings. There are 22 spindle speeds, ranging from 12·5 to 2,000 r.p.m., and 15 speeds for the face-plate, from 8 to 200 r.p.m. A 2-speed motor, of 10/13·5 h.p., is used for the spindle and face-plate drive, the motor speeds being 1,500 and 3,000 r.p.m., and all speeds are selected by single-lever control. Special provisions have been made in the headstock gearbox to prevent excessive wear and damage to the ends of the gear teeth.

Workpieces weighing up to 2 tons can be supported on the rotating table, which has a working surface measuring 1,120 by 900 mm. (44 by 35½ in.). The table has maximum traverses of 1,150 mm. (45¼ in.) in the longitudinal direction, and 1,000 mm. (39⅜ in.) crosswise. The boring spindle and the outboard support bearing can be elevated from 0 to 1,000 mm. above the working surface of the table. Steplessly-variable rates of feed are provided for the table (longitudinally and transversely), the headstock and support bearing (vertically), the spindle (axially) and the facing slide (radially), by means of an amplidyne system. Indicators are fitted which show the feed rates in mm. per rev., and these rates range from 1·4 to 1,110 mm. (0·055 to 43·701 in.) per min. for the table and spindle head, from 2·2 to 1,760 mm. (0·087 to 69·291 in.) per min. for the spindle, and from 0·88 to 700 mm. (0·035 to 27·559 in.) per min. for the facing slide. All these members can be rapid-traversed, the rates being approximately double the normal maximum feed rates. The maximum feeding force that can be applied is 1,500 kg. (3,300 lb.), the maximum torque at the spindle is 223 lb./ft., and the maximum torque at the facing slide is 323 lb./ft. Threads can be cut with Metric pitches ranging from 1 to 10 mm., the range of English threads being from 4 to 20 per in.

An optical measuring system is provided for co-ordinate setting, measurements being made with the aid of projection screens, from master scales with 0·01-mm. (0·0004-in.) divisions. All moving elements are clamped in two mutually-perpen-

dicular planes, in order to reduce the effects of working clearances and their attendant errors. All motions are controlled, and speeds and feeds are selected, from the main panel on the headstock, through an electrical system, and there is an auxiliary panel, for remote control, mounted on the column for the outboard support bearing. The machine weighs approximately 13½ tons, and is 18 ft. long, 10 ft. wide, and 10 ft. high.

A larger horizontal boring machine, of a similar design to the type 2620A has been developed, and individual machines are now being built. This borer has a table measuring 1,600 by 1,250 mm. (63 by 49 in.), and is provided with a large-screen optical measuring system. The spindle is of 125 mm. (4·921 in.) diameter, and the maximum spindle speed is 1,200 r.p.m. It may be of interest to note that series production of this machine is to be undertaken by the Komsomolensky Machine-tool Plant.

HEAVY-DUTY HORIZONTAL BORING MACHINES

The larger boring machines in the Sverdlov range are built to order, and one of these heavy-duty machines is shown in Fig. 3, at the end of one of the shops of the Leningrad plant. This machine is designated type 2657C, and incorporates four main units, which are separately mounted, namely, a baseplate, a traversing column and head assembly, a table assembly, and an outboard support. When required, the table assembly can be removed, and workpieces are then mounted directly on the baseplate. The main column can be traversed on vee and flat guideways, and the headstock has a main spindle of 150 mm. (5·905 in.) diameter, also a facing slide. Spindle speeds are electronically controlled, and are steplessly-variable up to 1,000 r.p.m., the speed in use being indicated by means of a dial on the headstock.

Measuring 2,250 by 1,800 mm. (88½ by 70⅞ in. approximately), the table has longitudinal and rotary motions only. Rate of traverse of the table, also of the headstock vertically, the spindle longitudinally, the facing slide radially, and the column transversely, are steplessly-variable, and are regulated by means of a special electronic control system that has been developed in the Sverdlov plant. Control is effected by movement of a single, hand-actuated star-wheel, and the traverse rates can be varied steplessly in a ratio-range from 1:1 to 1:1,800. The actual feed rates depend on the requirements of the particular unit that is to be moved, and on the gearing employed. Under amplidyne control, the constant-torque, variable-speed motor provides input speeds ranging from 2 to 3,600 r.p.m., and, with suitable gearing, one group of feed rates may vary from 0·1 to 180 mm. per rev., for example. This Sverdlov system, it may be noted, is widely used on machine tools built by other plants in the Soviet Union.

There is a heavy-duty boring machine of generally similar design to the type 2657C, but with a column and bearing support that are fixed in position transversely but are movable longitudinally, and a table that can be traversed crosswise. The type 2656C machine, seen in the heading illustration, has a fixed baseplate and traversing column. Of 175 mm. (6.889 in.) diameter, the spindle of this machine can be run at a maximum speed of 1,000 r.p.m., and the same method of feed control is employed. A large traversing-table boring machine is shown in Fig. 4. Designated

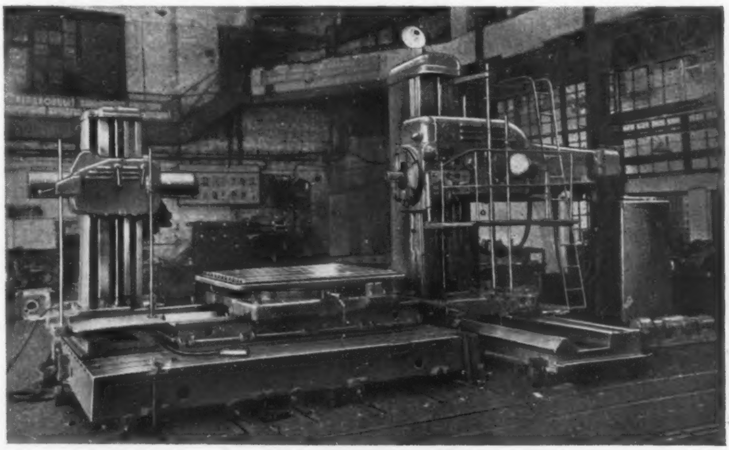


Fig. 3. This Large Horizontal Boring Machine, Seen at the End of One of the Shops in the Leningrad Plant, Comprises Four Separate Units, which Can be Used in Combination or Separately, as Required

type LR66C, this machine has a table measuring 5,000 by 2,500 mm. (16 by 8 ft. approximately), and a 150-mm. (5·905-in.) diameter spindle that can be run at a maximum speed of 1,000 r.p.m. The crosswise travel of the table is 5,000 mm., and it is supported on the vee and flat guideways of the bed for the whole of this movement. The Sverdlov feed control system is again employed, and the travel of the various members is indicated by large dials, one of which can be seen at the right-hand side of the headstock, and another on the column base. This machine weighs 55 tons, complete.

COPY-MILLING MACHINES

A number of different copy-milling machines is made at the Sverdlov plant, and the type 6441B semi-automatic machine is shown in Fig. 5. In principle, this unit is similar to the Keller machines, the master and work being mounted one above the other, and the master being scanned by the stylus of an electrical follower unit on top of the cutter head. The electrical control system provides for full 360-deg. copying, the motions of the cutter spindle, spindle head, and work table being engaged by electro-magnetic clutches. Workpieces measuring 900 by 500 mm. (35½ by 19⅝ in.) can be machined, and the maximum depth that can be milled is 300 mm. (11 13/16 in.). Spindle speeds up to 3,100 r.p.m. can be employed, and the maximum traverse rate for copying is 315 mm. (12·402 in.) per min.

A larger machine, of generally similar design, is built, and is designated type LR105. Workpieces measuring 1,400 by 800 mm. (55⅛ by 31½ in.) can be machined, to a maximum depth of 800 mm., and the spindle speeds range up to 3,150 r.p.m. The largest Sverdlov copy-milling machine—type LR29—will mill workpieces measuring 3,200 by 1,800 mm. (126 by 71 in.), and the maximum depth that can be machined is 1,000 mm. (39⅜ in.). A new design was introduced last year, and differs from the other machines in that the maximum traverse speed for copying is 750 mm. (29·53 in.) per min. The spindle of this type LR93 machine can be run at 1,800 r.p.m., and workpieces measuring 2,250 by 1,120 mm. (88½ by 44 in.) can be milled, to a maximum depth of 900 mm. (35½ in.).

SPECIAL MACHINE TOOLS

The building of special-purpose machine tools is an important activity of the Sverdlov plant. Single- and multiple-spindle boring machines have been supplied to works in the Soviet Union engaged in the production of motor cars, electrical equipment, and steam and electric locomotives, also to shipbuilding yards. Many of the special boring machines incorporate standard heads and other units developed by the plant, and a 2-spindle boring machine for operations on the housings of driving motors for electric locomotives is shown in Fig. 6. The complete machine weighs approximately 45 tons, and has two headstock units of standard design—one designated LR79A and the other LR79B. Both heads operate simultaneously, on an automatically controlled cycle, which is started by pressing a push-button on the control panel at the front of the machine. For convenience during setting, the complete panel can be removed

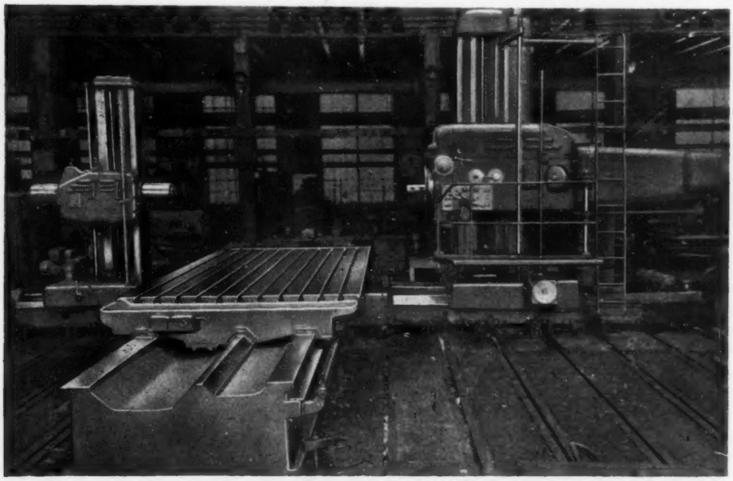


Fig. 4. Of the Traversing-table Type, the Sverdlov LR66C Boring Machine, Here Shown, has a Spindle of Approximately 6 in. Diameter, which can be run at 1,000 r.p.m., and Incorporates an Amplidyne-drive for the Feed Motions

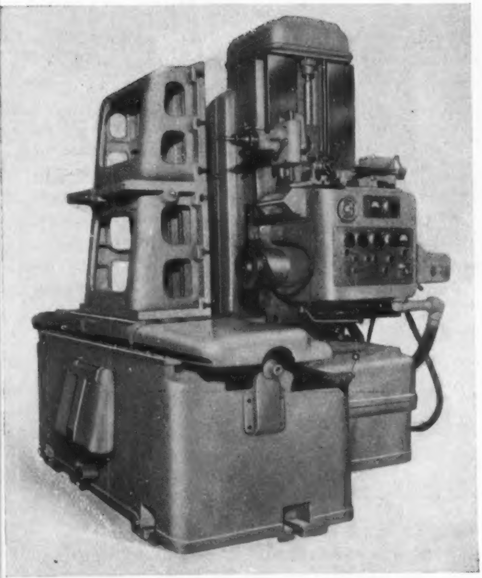


Fig. 5. A Range of Copy-milling Machines is Made by the Sverdlov Plant, and the Type 6441B is Here Shown. It Operates on a Semi-automatic Cycle, and has an Electrical Copying System

from its support, and moved to any position on the machine, to which it is connected by means of a long multi-core flexible armoured cable.

Two parallel bores are machined in the work-pieces, which are mounted on their sides. Each workpiece remains stationary and is clamped in position by arms connected to an electro-mechanical system, which is controlled from the push-button panel. On either side of the work-support fixture there are pairs of massively-proportioned guide bushes, to support the boring bars. The two heads move on the vee and flat slideways of bed units at the right-hand end of the machine (as viewed in Fig. 6), and each is traversed by means of a short, driven screw, mounted below the head, which engages the teeth of a long half-nut, which is made in sections, and installed between the bed ways. Steplessly-variable feed rates are provided by an amplidyne system—similar to that already mentioned—and to facilitate setting, the position of the head is indicated by a large indicator dial at the lower right-hand end of the unit. The boring bars are arranged for radial adjustment of the cutting tools, and the mechanism is power-operated and push-button controlled. A second dial is mounted on the front of each headstock to indicate the radial position of the tool.

A larger machine, with two head units of greater capacity but generally similar design, has been built for line-boring operations on the main castings of diesel engines for locomotives, which may range up to 5 metres (16·4 ft.) long. Another special machine which has been built for diesel engine production is equipped with a tracer control system, whereby the workpiece is aligned automatically with the machine spindle in the various positions required for boring a number of holes. Special copy-milling machines have also been built, and one large unit, for the production of tyre moulds, will accept workpieces up to 9 ft. diameter.

Fig. 6. The Double-head Machine here shown is Employed for Boring Operations on Electric Traction Motor Bodies and has been Built by the Sverdlov Plant. It Incorporates Headstock Units of Standard Design which are Traversed by Short Screws and Long Half-nuts, Installed Between the Bed Ways

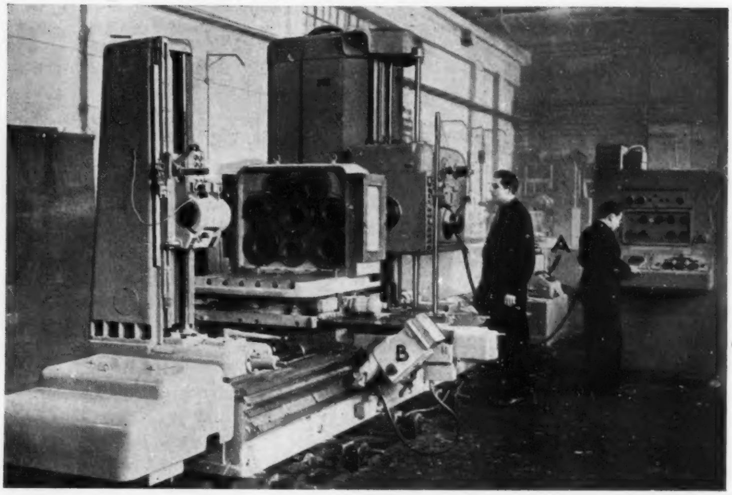


Fig. 7. The Numerical Control System Fitted to this Type 262PR Sverdlov Horizontal Boring Machine Provides for Co-ordinate Setting by "Dialling" or by means of Punched Cards. A Similar Machine is being Displayed in the Soviet Pavilion at the Brussels Exhibition

PROGRAMME-CONTROLLED BORING MACHINES

For a number of years, an increasing interest has been shown in numerically-controlled boring machines at the Sverdlov plant, and a number of different types have been developed. Fig. 7 shows a type 262PR horizontal borer which is arranged for numerical control, either by "dialling" or by the use of punched cards, and a similar machine is being shown in the Soviet pavilion at the Brussels exhibition. The machine is here seen in the course of trials at the Leningrad works. As may be observed, the design follows normal Sverdlov practice, and it has been developed from the type 2622, which has an optical measuring system. The programme control console is seen at the right, and it is connected to the machine by a multi-channel cable, so that it may be located in any convenient position. A separate card-reader, which is just visible at *A*, is employed when machining operations are performed under punched-card control.

The control system permits the pre-selection of the longitudinal and transverse positions of the table, and the vertical setting of the headstock, over the full ranges of travel, the units being moved automatically to the selected positions within an accuracy of $\pm 0{\cdot}05$ mm. (0·002 in.). Cutting speeds, feeds, and positioning rates can be pre-selected and changed during the machining cycle, at predetermined positions in the table and head movements. Information, in decimal form, is "dialled" by means of telephone-type units on the control console.

When punched-card control is employed, information for ten positions of the table longitudinally and tranversely, and of the headstock vertically, can be recorded by piercing the card in accordance with a binary code. All the positional information, in decimal form, is "dialled" on the main console, and is automatically converted into a binary code and punched into the card. In the card-reader, the card is mounted on a stationary drum, which is swept by a series of contact members, carried by a rotating beam. These members sense the positions of the perforations as the beam travels round the drum. When required, the machine can be arranged to operate on an intermittent cycle, with pauses for tool changing, and it can also be employed for milling transverse faces on a workpiece, under automatic cycle control.

For co-ordinate setting, the machine is fitted with metal precision scales, graduated in increments of 1 mm. (0·0394 in.), and photo-electric sensing units. One such unit may be seen at *B* in Fig. 7, and provides for recording the longitudinal position on the table. Similar units are fitted for the transverse setting of the table, and the vertical setting of the headstock, but, for convenience, only the control of the longitudinal movement of the table will be considered. An image of the master scale is projected by means of an optical system on to a screen in the unit *B*, and a photo-electric cell in this unit senses the images of the scale-graduations, and transmits a signal to the control console, for each 1-mm. of table travel. When the table approaches the required setting, its rate of motion is gradually reduced, and it moves at a slow speed until it has completed the

nearest whole-millimetre distance that is less than the required dimension. Then, a fine-position unit is brought into operation, and this unit can be adjusted, by means of a servo-motor, relative to the main sensing unit, over a distance that corresponds to the pitch of the graduations on the scale-image projected on the screen. The fine-positioning unit incorporates a photo-electric cell and a special shutter mechanism which is opened at the completion of each 0·01-mm. (0.0004-in.) of table movement, to permit the passage of light from the screen to the photo-electric cell. The light pulses are converted into electrical signals by the cell, and these signals are transmitted to the control console, where they are counted electronically. The table continues to move at slow speed until the required number of signals have been received, corresponding to the decimal portion of the specified dimension, and is then stopped.

The 262PR machine has a spindle of 110 mm. (4·330 in.) diameter, which is bored for No. 6 Morse taper shanks, and has a maximum axial movement of 710 mm. (27·952 in.). Measuring 1,120 by 920 mm. (44 by 36 in. approximately), the table has a maximum travel of 1,150 mm. (45·275 in.) longitudinally, and 1,000 mm. (39·370 in.) transversely, and the spindle can be positioned vertically from 0 to 1,000 mm. above the table surface. There are 22 spindle speeds, from 12·5 to 1,600 r.p.m., and the maximum torque that can be applied is approximately 2,900 lb.-in. The feeds for the table and headstock range from 1·4 to 1,110 mm. (0·055 to 43·7 in.) per min., and for the headstock spindle from 2·2 to 1,760 mm. (0·087 to 69·3 in.) per min., the feed indicators being calibrated to read in mm. per rev. Threads from 1 to 10 mm. pitch, and from 4 to 20 t.p.i. can be cut, and the greatest weight of workpiece that can be mounted on the table is approximately 2 tons. The machine is driven by a 1,500/3,000 r.p.m. A.C. motor, of 10/13·5 h.p.

LARGE JIG-BORING MACHINE

Large jig-boring machines (type LP87) are now in series production at the Sverdlov plant, and one of these machines is being exhibited at Brussels. Another is seen in Fig. 8, installed in one of the shops of the Leningrad works. Of the portal type, the machine has two spindle heads, one on the cross-rail, and the other on the right-hand upright, a support bearing for use with the latter head being carried on the left-hand upright. The heads are independently driven, and the maximum spindle speed is 1,800 r.p.m. An automatic level-correcting system is incorporated for the cross-rail, to ensure that the latter member is always parallel with the surface of the work-table. The table, which will support workpieces weighing up to 37 cwt., measures 2,200 by 1,400 mm. (6 by 4½ ft.). A separate electrical system is incorporated for the traverse motions which provides an exceptionally wide range of feed rates, and permits "inching," under push-button control, in increments of 0·001 mm. (0·00004 in.). The optical positioning system for the table and spindle heads is stated to permit settings to be made within an accuracy of 0·002 mm. (0·00008 in.). With this system, enlarged images of the positioning scales are projected on to viewing screens for the heads

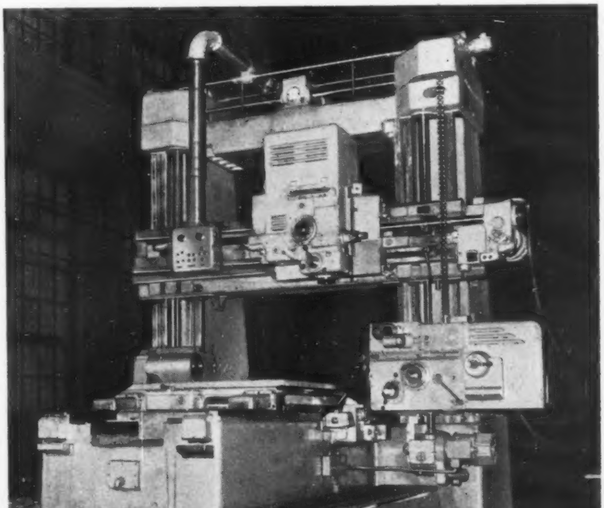


Fig. 8. Large Jig-boring Machines of this Type are now in Series Production at the Sverdlov Works. It is Claimed that Co-ordinate Settings can be Made to an Accuracy of 2 microns (0·00008 in.), and a Machine of this Design is being Exhibited at Brussels

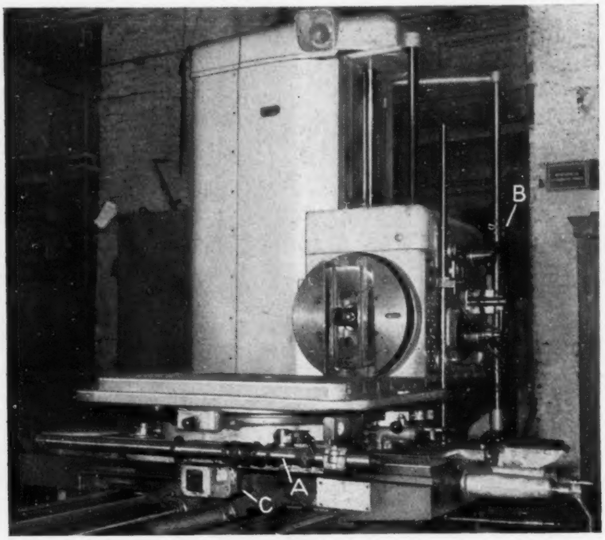


Fig. 9. The Prototype 2620A Horizontal Boring Machine, Here Shown, has been Fitted with an Electro-mechanical Positional Control System for the Table and Headstock

and table. All motions, and the selection of speeds and feeds, are controlled from a pendant panel, by means of push-buttons and selector knobs, as well as from the heads. The panel is carried on the lower end of a telescopic support-arm, of cranked shape, which is mounted on guideways above the main bridge structure. An individual motor is provided for traversing the arm, and is controlled from push-buttons on the panel. The machine, which weighs approximately 36 tons, can be provided with a programme-control system, similar to that already described, whereby boring operations can be performed from punched cards, or by " dialling."

WORKSHOP FACILITIES

The various standard machines in the Sverdlov range are being built in batches, and, as might be expected, the production methods and equipment employed are conventional. Reliance is placed on accurate machining and fitting, and large numbers of general-purpose machine tools are installed in the Leningrad works. For the initial operations on the major castings, there are planing and plano-milling machines of various sizes, and many of these machines are American built. A Cincinnati Hypro planer was being used for finishing the slideway surfaces of bed castings, at the time that this article was prepared, and for this purpose a flat tool, about 6 in. wide was employed, with paraffin as a lubricant. A smooth, high-quality finish was produced, and the only subsequent operation that was carried out was the mottling of the slideway surfaces with a scraper to ensure effective lubrication. This procedure is adopted for bed-castings up to 10 metres (32·8 ft.) long.

Among other American equipment was noted a large Reed-Prentice vertical milling machine, and King and Bullard vertical boring and turning mills. Although all the foreign equipment was fairly old, it appeared to be in good condition. All machines in the plant are systematically serviced, under a planned preventive maintenance scheme.

Extensive use is made of boring machines built in the plant, and many prototype machines have been installed in the Leningrad works in order that first-hand experience may be gained with regard to their performance under normal operating conditions, also to enable modifications and improvements to be carried out, which may be incorporated in later designs. In Fig. 9 is shown the prototype for the latest 2620A design, to which reference has already been made. This machine is generally similar to the production type, Fig. 2, but has been fitted with an electro-mechanical position control system for the table and headstock. Indexing stop-bars are provided for the table-saddle transversely, and for the headstock vertically, as indicated at *A* and *B* respectively. Eight stop units are slidably mounted on each bar, and each unit consists of two members, similar to bearing caps, which are provided with screws for clamping the assembly in any position along the bar. A lug on one member carries a screw, parallel with the bar, which provides a means of fine setting. The stops can be set at different angles on the bar, so that each screw, in turn, can be brought into alignment with a trigger that projects from a casing secured to the table-saddle or table. Each casing houses a limit switch, and the unit for the table-saddle is indicated at *C*, in Fig. 9. The limit switch controls an electro-magnetic clutch in the associated traverse drive mechanism, and when a stop engages the trigger, the limit switch is tripped and motion is stopped.

The first type 262G Sverdlov horizontal boring

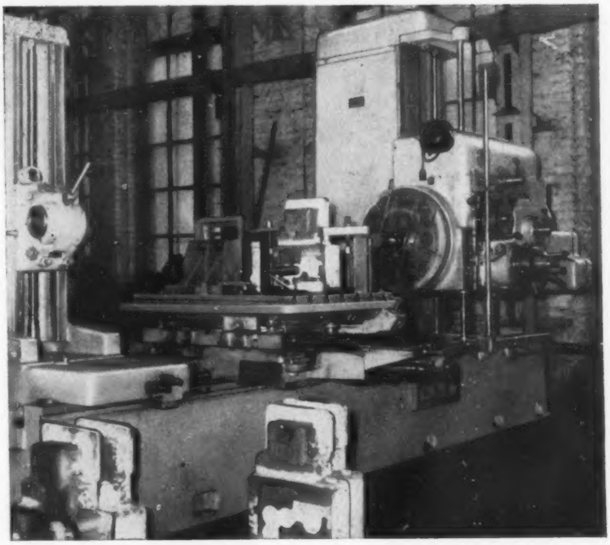


Fig. 10. This Prototype of the Obsolescent Type 262G Boring Machine has been Employed at the Leningrad Works for more than Twelve Years. Experience Gained from the Use of this Machine has Led to New and Improved Designs

machine to be built has been in use in the plant for more than twelve years, and is seen in Fig. 10 set up for boring cover castings for feed gearboxes. As these parts are for a machine that is not built in large batches, the castings are mounted on the boring machine table, with the aid of simple clamps and an angle plate, and each hole is bored individually. On the machine headstock, there is a large star-wheel for traversing the cutter spindle by hand, and in the centre of this wheel there is a single lever control for selecting the speeds and feed rates, which are indicated on annular scales. In addition, there are separate dials and selector levers for the speeds and feeds, and knobs for engaging the various traverses, in both directions of movement.

Special multi-spindle units are provided for boring operations on headstock and gearbox castings that are required in greater numbers, and the equipment for machining a total of 13 holes in hand-feed gearboxes for type 2620A machines is shown in Fig. 11. This jig is used on the small boring machine in the background, and a workpiece may be seen at the right. All the necessary drills and multi-tooth boring cutters are kept mounted on arbors in the fixture, and the ends of certain arbors may be seen projecting at the left. Each arbor, in turn, is connected to the boring machine spindle by means of a quick-change coupling. High-speed steel drills are employed, and the cutters have tungsten-carbide tipped teeth. The casting is located from the flange and previously machined holes, and when certain of the holes in one plane have been bored, the machine table and the fixture are indexed through 90 deg., to enable further operations to be carried out.

Adjoining the main workshops, there is a well-equipped standards room for checking tools and gauges, and most of the workers in this section are women. Tools and gauges are checked in the workshops each time that they are used, and are sent for inspection in the standards room

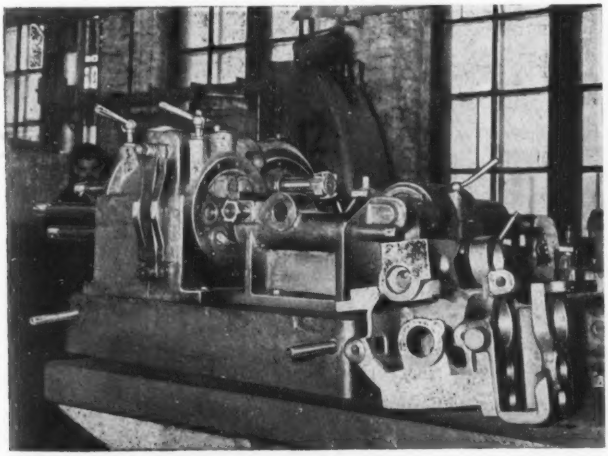


Fig. 11. Hand-feed Gearboxes, One of which is Seen at the Right, are Bored with the Aid of the Large Fixture Shown. The Fixture Incorporates 13 Spindles and Cutting Tools, and is Used on the Small Boring Machine in the Background

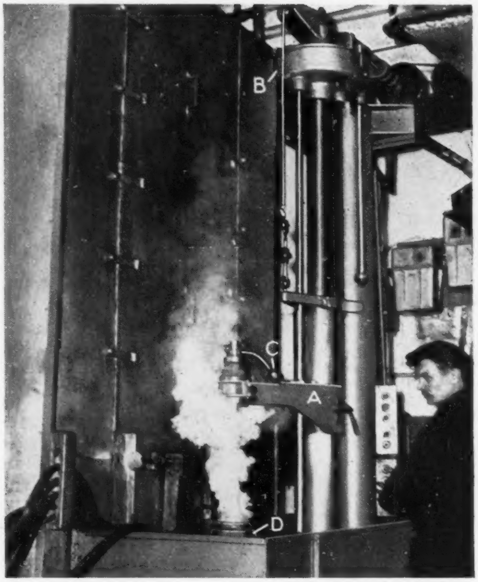


Fig. 12. Spindles and Shafts are Induction Hardened by Means of this Rig, which is Installed in the Main Heat-treatment Department. The Workpiece is Supported Vertically, and is Lowered Through an Inductor Coil into a Quench Tank

at predetermined intervals, based on statistical analysis. There is a heat-treatment department at one side of the light-machining bay, and the equipment includes pit-type furnaces for nitriding treatment, with capacity for workpieces up to 3·5 metres (approximately 11½ ft.). A large high-frequency unit with a rating of 200 kW. is also installed. This unit supplies power for the induction hardening rig, shown in Fig. 12, which provides for the treatment of workpieces up to 450 mm. (17·7 in.) diameter by 900 mm. (35·4 in.) long.

INDUCTION HARDENING EQUIPMENT

The induction hardening rig has a large tank for quenching oil, above which can be mounted interchangeable ring-type work-coils. A vertical column at one side of the tank supports a vertical guide-member, whereon slides a sleeve carrying a pair of cantilever brackets, one of which may be seen at *A*. There are two feed-screws parallel with the guide-member, and one of these screws provides for raising and lowering the sleeve and the lower cantilever bracket, which is permanently secured to it. The bracket *A* incorporates a split bearing, so that it may slide on the sleeve and be clamped to it by means of a lever-screw, and the second feed-screw provides for adjustment of the bracket *A*, when the clamping screw has been released. Each screw is driven by an individual electric motor, mounted on a platform at the top of the column, through the gearbox *B*. These motors are independently controlled by push-buttons on the pendant panel seen adjacent to the operator in Fig. 12. The sleeve assembly is counterbalanced by a weight in the column, to which it is connected by a steel cable.

At the outer end of the lower cantilever bracket there is a chuck mounted on a vertical spindle which can be motor driven. The bracket *A* has a semi-circular seating and a screw-operated, swinging clamp at its extremity, these members serving to hold a short quill assembly, with a live cone-centre at its lower end. This centre can be raised and lowered by means of a barrel-cam, to which the handle *C* is connected. The arrangement is such that shafts and similar workpieces can be passed through the work-coil, indicated at *D*, and gripped at one end in the jaws of the chuck, when the latter is in its uppermost setting. The other end of the workpiece is then supported by the cone-centre secured to the bracket *A*. By engaging the chuck-spindle drive, the work is rotated, before the high-frequency supply to the coil is switched on. After a brief dwell period, to allow for the initial heating of the work, the drive to the traverse screws is engaged, and the sleeve, brackets and work are lowered. The workpiece passes through the coil at a suitable traverse-rate, so that it is heated to the desired depth, and passes into the oil bath whereby it is progressively quenched. As may be observed, a considerable volume of heavy smoke is generated during the induction hardening operation, and, normally, a large sheet-metal shroud, connected to an exhaust system, is swung over the working zone, and the smoke and fumes are extracted. The photograph for Fig. 12 was taken when the shroud was not in position, to enable details of the gearbox and drive arrangements for the traversing screws to be observed.

In addition to serving the rig that has been described, the high-frequency generator also supplies power for another installation in the machine shop adjoining the heat-treatment department. This equipment comprises a Kolomensky lathe, and a large inductor coil assembly, suspended from an overhead rail above the lathe bed. The coil

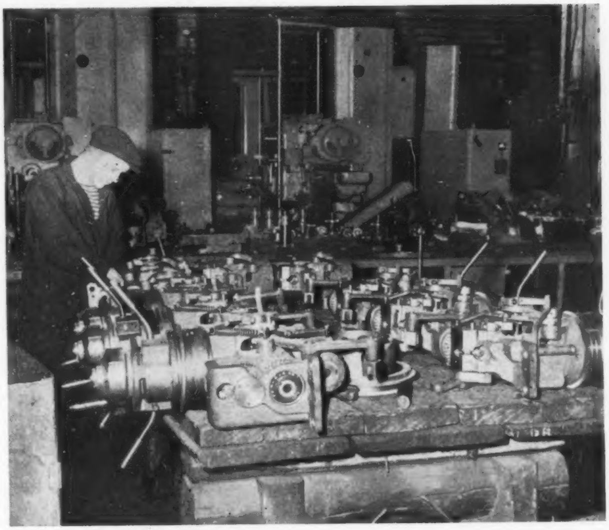


Fig. 13. Part of the Main Assembly Shop with the Sub-assembly Bench for Building Hand-feed Gearboxes in the Foreground. When the Assembly Operations have been Completed, the Gearboxes are Transferred to a Bench at the Side of the Machine Assembly Section, in the Background

assembly is enclosed in a split shroud, and incorporates cooling-water sprays. Workpieces, such as spindles and shafts, up to 1 metre (3·28 ft.) diameter by 10 metres (32·8 ft.) long can be mounted in the lathe, and the inductor coil assembly can be coupled to, and traversed by, the lathe saddle. The coil can be adjusted for height relative to the work-surface, and by rotating the work and traversing the coil, workpieces of considerable size can readily be induction hardened.

MACHINE ASSEMBLY SHOPS

Due to restrictions on factory building, the space available for the assembly of standard and special machines is somewhat restricted, and conditions are rather cramped. The main assembly shop is divided into two bays, both of which are spanned by overhead travelling cranes, and standard boring machines are built in rows that extend down the length of one bay. Sub-assembly operations are carried out at benches in the adjoining bay, and the bench for the assembly of a given unit is located adjacent to the station in the main assembly bay where that unit is fitted to the machines. A typical sub-assembly bench is shown in Fig. 13, and here hand-feed gearboxes are built. The main castings for these units are bored in the fixture seen in Fig. 11. Gearboxes are assembled in batches (of ten, in this instance), and, when completed, the batch is transferred to a bench that extends down the side of the main assembly line, seen in the background.

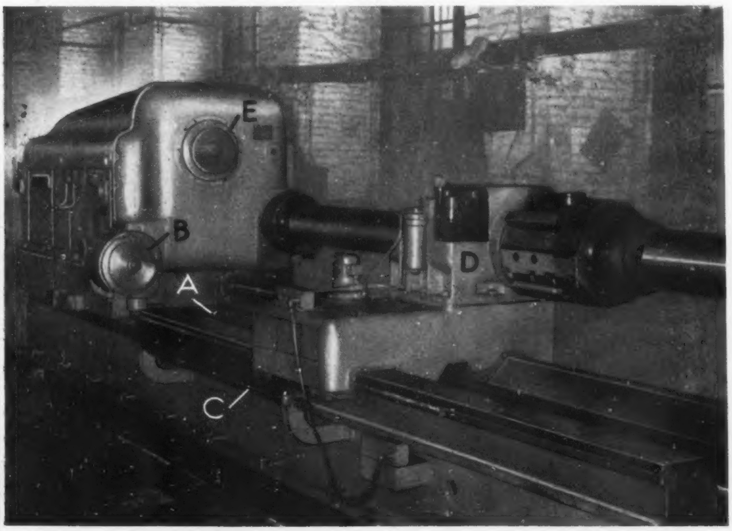


Fig. 14. This Special Boring Unit is One of Three to be Incorporated in an Installation for Machining Electric Motor Frames. The Boring Bar has Provision for Feeding the Cutting Tool Radially

Among the equipment in the assembly section for special-purpose machines was the boring unit seen in Fig. 14. This unit is one of three which will form a special installation for machining the bodies of large electric motors. The headstock is of typical Sverdlov design, and is generally similar to those fitted to the large special-purpose machine in Fig. 6. Driven by a motor of approximately 50 h.p., it has spindle speeds ranging from 16 to 250 r.p.m., a speed of 125 r.p.m. being employed for this particular application. It is traversed on the vee and flat guideways of the bed by means of a short screw and a long half-nut, part of the latter member just being visible at *A* between the bed-ways. The travel of the headstock (and the boring bar fitted to the headstock spindle) is indicated by the large rotating dial *B*. This dial is geared to a vertical shaft, at the lower end of which there is a pinion that meshes with a fine-pitch rack secured to the front shear of the bed. An indexing stop bar *C* is also fitted at the front of the bed, and carries adjustable dogs which engage limit switches on the headstock to control the length of travel, and engage the tool retraction and return motions, when the unit is operating on a semi-automatic cycle. A fixed dog at the far end of the bed serves to stop the head at the end of the return stroke.

The machine is seen fitted with a large boring bar, which incorporates mechanism for feeding the tool radially. This bar is supported in a close-fitting, pressure-lubricated bearing in the steady unit *D*, and a second outboard steady will be provided to support the free end of the bar. Since the bar must slide and rotate in the steady bearings, it is made from nitriding steel, and hardened to Rockwell 70 C. The bar is of tubular construction, and to facilitate production, it is in two sections, which are coupled together on the side of the cutter head remote from the headstock. Radial adjustment of the tool is effected from the headstock, and the tool movement is indicated by the large dial *E*.

Further articles in this series, concerned with Soviet engineering plants and research establishments, will be published shortly in MACHINERY.

Sump Drilling Fixture with Hydraulic Clamping

In the accompanying illustration is shown a set-up—with guards partially removed—employed at the works of Jaguar Cars, Ltd. It is necessary to drill 30 holes of $\frac{1}{32}$ in. diameter through the flange of a steel oil sump, which is 0·048 in. thick, and is backed up by ¼-in. thick stiffening plates, spot welded at intervals. Pressure of the drills against the stiffening plates tends to spring them away from the flanges, and swarf might enter the gaps thus formed, and cause distortion.

Provision has therefore been made for secure clamping around each hole. For this purpose, 30 Newton hydraulic jacks (Newton & Bennett, Ltd.) are employed, each of which operates a forked clamp. The component is thus lifted ¼ in. from the loading rails and held securely against the drill thrust. At one end, the clamps are carried on a falling gate, which can be locked in position and serves as an end location for the component.

Clamping is controlled by a single hand-operated valve which admits air, at 80 lb. per sq. in. pressure, to two Newton hydro-pneumatic intensifiers, of 10 cu. in. displacement, which are coupled in tandem. A pressure switch is incorporated in the system, and the machine cannot be started if the pressure is below a predetermined value. The floor-to-floor time is less than 2 min.

Drilling Fixture for a Jaguar Car Sump Incorporating 30 Newton Hydraulic Jacks

Automation Applied to Small-batch Production

Fig. 2. Digitape Panels for the Electronic Control of All Movements of the Battery of Machines Seen in Fig. 1

Automation, hitherto, has been applied mainly to the quantity production of identical parts. Recently, however, a battery of three numerically-controlled machine tools has been installed in one of the plants of the Hughes Aircraft Co., Culver City, Calif., U.S.A., which can simultaneously handle three different kinds of parts. Moreover, by merely changing tapes and work fixtures, which can be carried out in two or three minutes, other types of work can be handled. Consequently, it may be economical to produce even a single piece on the machines, and in an aircraft plant, for example, it is not necessary to maintain substantial inventories of those parts which are required only occasionally. The machines were built by the Kearney & Trecker Corporation, Milwaukee, Wis.,

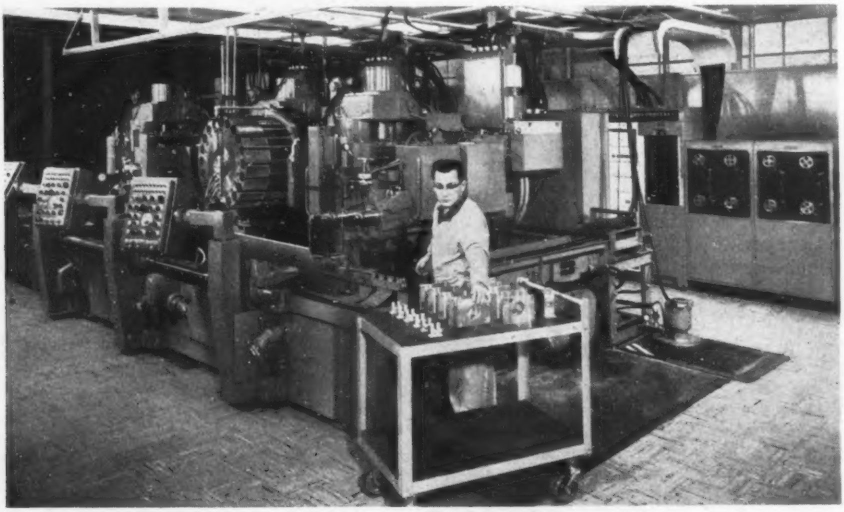


Fig. 1. Battery of Tape-controlled Machines for Performing Milling, Drilling, Reaming, Tapping, and Boring or Fly-cutting Operations on Three Different Parts Simultaneously

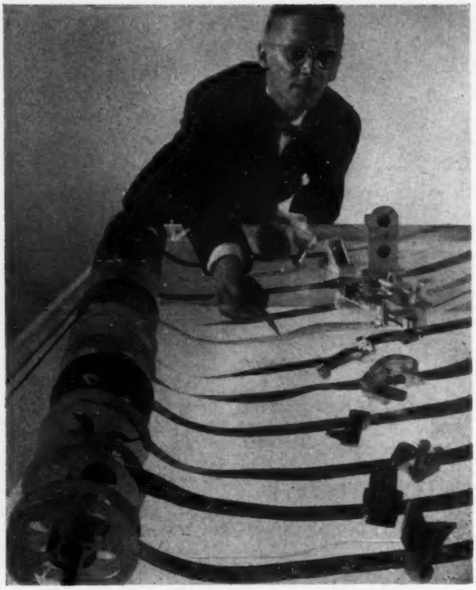


Fig. 3. Various Workpieces that have been Produced (Three Different Forms Simultaneously) and the Corresponding Control Tapes

and are operated by the Digitape control system, which was developed by the Hughes Co. With this system, equipment is operated from punched tapes and controlled by "transistorized" digital computers.

The line of machines which are shown in Fig. 1 are seen set up for producing parts for the Hughes electronic armament-control systems used on American and Canadian all-weather interceptor aircraft. On the first machine (at the far end) provision is made for performing any number of milling operations on a part, and the second machine can carry out a series of drilling, reaming, tapping, or counterboring operations. The machine in the foreground has two spindles for boring or fly cutting.

Successive operations can be performed at each station as the machines are designed for movement in three directions—in-and-out, up-and-down, and side-to-side. A series of holes or surfaces can thus be machined by any one unit, the machine performing indexing movements to position the cutters in relation to the work. Twenty different tools are accommodated by the turret on the central machine. This turret is indexed automatically to bring any required tool into line with the work.

It may also be noted that the operating radius of the fly cutter on the boring unit can be automatically changed to meet requirements. The work fixtures can be indexed under numerical control to present various faces toward the tools.

Fresh workpieces are loaded on fixtures as they come to the operator at the right-hand end of the line. They are then carried by a chain conveyor to the back of the line, where they are released on to a gravity conveyor that carries the fixtures to the far end of the machine. Here, the fixtures are placed on the transfer mechanism at the front of the machines.

From this point onwards, transfer of the work fixtures from machine to machine and operation of the various members of each machine—as well as indexing of the fixtures—are controlled by tapes in the cabinet seen in the foreground in Fig. 2. Four tapes are provided for this battery of machines to enable them to be set up for handling as many as four different parts. In theory, an unlimited number of tapes could be set up if suitable provisions could be made for handling a considerable variety of parts in sequence. Only three tapes would, of course, be in operation at any one time.

After each machine has performed the specified number of operations on a given part, the fixture and work are automatically transferred to the next

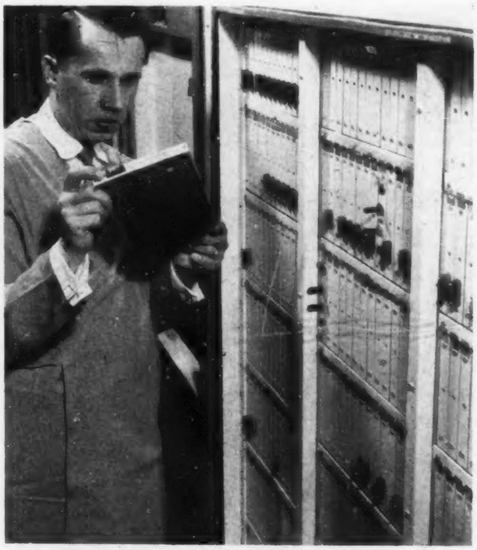


Fig. 4. Plug-in Circuit Boards, of the Type Here Being Inspected, are Employed in the Digitape Control Cabinets

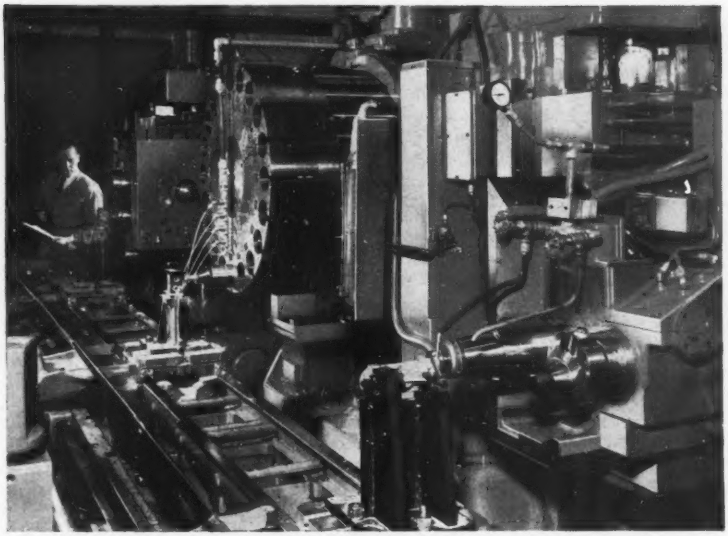


Fig. 5. Machines Arranged to Perform a Series of Operations on Three Different Workpieces Simultaneously Under Tape Control

unit. This procedure is repeated until the finished part reaches the reloading station. Where the parts are of simple form, more than one can be carried by a single fixture.

To the left of the tape cabinet in Fig. 2 are the cabinets which receive information from the tape "readers" and convert it into instructions for the various machine movements. The use of printed circuits, transistors, and diodes in the cabinet units saves space and reduces maintenance costs. Tapes are punched by means of a Hughes-designed keyboard. They can be readily produced by a typist who presses keys corresponding to numbers and symbols on a planning sheet prepared by an engineer. By means of the control boards, compensation can be made for tool wear without the need for re-punching tapes. Fig. 3 shows a variety of parts and, with each, the tape provided to carry it through the complete series of operations performed by the three machines. In Fig. 4 an engineer is holding a typical plug-in circuit board from one of the control panels.

Fig. 6. The Turret on the Drilling Unit which Accommodates 20 Different Tools

Fig. 5 is a close-up view showing various details of the machines. The milling machine in the background can be operated in three directions at feed rates ranging from 1 to 150 in. per min. and the spindle speeds range from 50 to 5,000 r.p.m.

An outboard support is provided for the spindle quills of the drilling machine, as may be seen in Fig. 6, so that special bushing plates are not required. Taps are fed by lead-screws to ensure accurate threading. If a tap or drill is accidentally broken, the spindle retracts. Drill spindle speeds from 110 to 9,000 r.p.m. are available.

The two boring spindles in the foreground of Fig. 5 cover a wide range of hole sizes. One spindle can be adjusted radially while the machine is in operation, and the other is arranged to receive a milling cutter.

Set-up time on the machines has been practically eliminated—in making a work change, all that is normally necessary is to change a tape. Only one operator is required, and he can be readily trained.

Microstics Grinding Arbors

A range of grinding arbors, some examples of which are shown in Fig. 1, has been introduced by Microstics Ltd., 218 Mare Street, London, E.8, for operations on hole bores down to 0·07 in. These arbors are the subject of a patent application.

The standard range covers wheel diameters from $\frac{1}{16}$ to 1¼ in. with shank diameters from ⅛ to ½ in. A feature of the arbors is that the abrasive is not moulded separately and then secured to the shank by cement, but deposited and bonded in position. Normally, the seating portion of the hardened and ground steel arbor is prepared with a slight knurl, but it is stated that a very effective bond can also be obtained on a plain surface. Fig. 2, is a view of a sectioned arbor and the intimate contact between the abrasive and the steel will be observed.

Apart from the standard forms with cylindrical wheels and shanks, special arbors can be supplied to meet particular requirements. Two such arbors are seen in the foreground of Fig. 1, where the abrasive has a concave end surface to provide for simultaneous face and bore grinding. In other instances, the shanks may be of special form to suit the machine spindle mounting arrangements. Such special arbors may be returned to the makers for re-coating when the abrasive has been consumed.

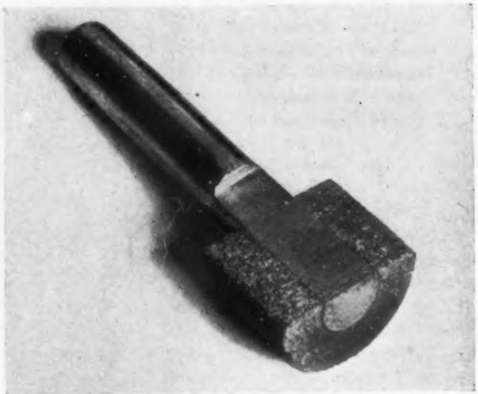


Fig. 2. A Microstics Arbor Sectioned to Show the Intimate Contact Between the Abrasive and the Steel Supporting Portion

With the method of construction employed, it is claimed, the abrasive head is more effectively supported and the maximum thickness of abrasive is provided compatible with arbor strength and outside diameter. Even when the abrasive has worn very thin it will not crack off the supporting shaft during dressing or grinding, and can be used right down to the steel surface. It is stated, indeed, that an arbor may be dropped on a concrete floor without damage.

A special abrasive mixture is employed for these arbors which is necessarily of such a composition that it can be bonded at a temperature that is not detrimental to the metal. This mixture, it is stated, is suitable for a wide range of precision grinding operations and provides a free cutting action with absence of loading or glazing. It is further claimed that the wheels will operate effectively wet or dry, over a considerable range of speeds, with a minimum of dressing and with a high rate of metal removal.

As an example of the results obtained with these arbors it is reported that 1¼-in. diameter by 1¾-in. long bores in milling cutters of Osborn's S.O.B.V.

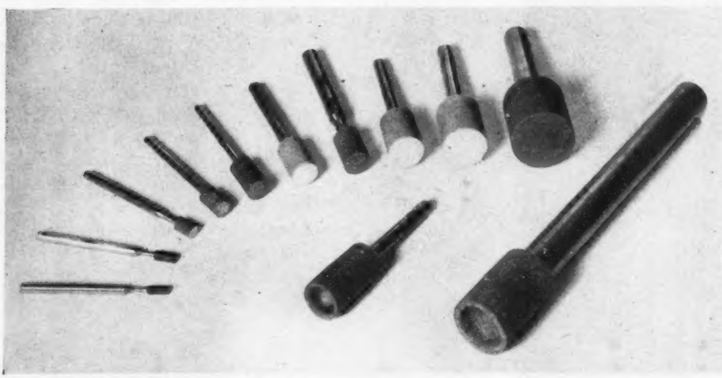


Fig. 1. Standard and Special Arbors Made by Microstics, Ltd. The Abrasive is Moulded and Bonded in Position on the Arbor

10 per cent cobalt alloy were ground dry, with a ¾-in. wheel, at a speed of 13,000 r.p.m., to limits of −0·0001 +0·001 in. The average metal removal was 0·008 to 0·010 in. and the average number of holes ground per arbor, without attention after the initial dressing, was 66.

In another instance, $\frac{9}{16}$-in. diameter by $\frac{11}{32}$-in. long holes were ground in steel components hardened to 62 Rockwell C, with a ½-in. diameter wheel at a speed of 20,000 r.p.m., to limits of −0·00001 +0·0001 in. Average metal removal was 0·006 in. per 0·001 in. of wheel wear, and 10 holes were ground to a surface finish of 5 micro-inches, at the rate of 1 min. per hole, before the wheel required dressing. The finish obtained in these components was such that a honing operation, required for the method previously employed, was no longer necessary.

As an indication of the performance obtainable on S.80 stainless steel, it is stated that 1¼-in. by ⅜-in. long bores were ground wet with a ½-in. wheel running at 60,000 r.p.m. to limits of ±0·0001 in. Average metal removal was 0·006 in. and wheel wear 0·0002 in. per hole. Twelve holes were finished to 6 micro-inches, and the time per hole was 3½ min. Next, some components of the same design, but in aluminium, were ground to the same limits, at the rate of one in 2 min. Wheel wear was 0·0001 in. per hole, and a finish of 11 micro-inches was obtained. Subsequently, grinding of the stainless-steel components was resumed. The wheel was dressed only before grinding was begun, and during the sequence of operations described it received no attention, and was still not in need of re-dressing at the conclusion of the tests.

A tool-room operation which was carried out on a Moore jig grinder, involved the finishing of 0·202-in. diameter by ⅜-in. long bores with a 0·19-in. wheel. Grinding was performed dry, with a spindle speed of 20,000 r.p.m. Average metal removal was 0·025 in. and 10 holes were completed before the wheel required re-dressing. The amount of wheel wear during this period was 0·002 in.

A High-precision Lathe Headstock*

Workers in the Eindhoven Research Laboratories of N. V. Philips Gloeilampenfabrieken, Eindhoven, Netherlands, were faced with the problem of machining flat or profiled end surfaces on such items as plastics lenses to a high degree of accuracy. Although normal and special toolroom lathes provide for machining accurate cylindrical surfaces to tolerances of a few thousandths of a millimetre, and with surface roughnesses of only a few micro-inches, as a rule these machines are not fitted with spindle thrust bearings which will enable such tolerances to be maintained during a facing or end profiling operation. A spindle bearing which enables a very high degree of axial and

* Abstract from Philips Technical Review, vol. 19, 68-69, 1957/8 No. 2.

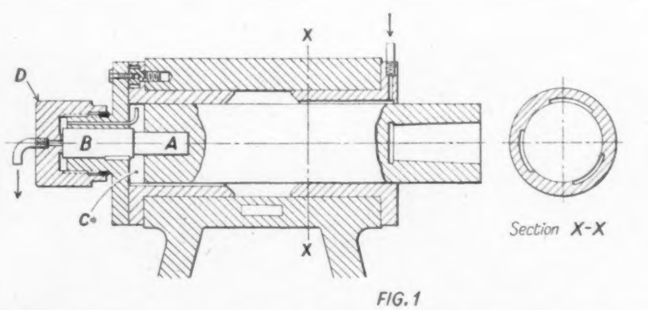


FIG. 1

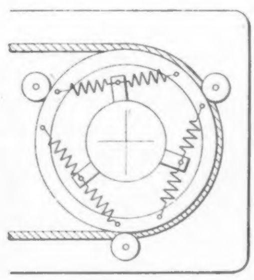


FIG. 2

Fig. 1. Sectional View of a Lathe Headstock Spindle Designed by Philips Research Laboratories, Eindhoven, for Precision Facing Operations. Reduced Air Pressure in the Compartment *C* Causes the Spindle End to be Held in Contact with the Thrust Block *B*. Fig. 2. The Pulley for Driving the Spindle on the Precision-facing Lathe is Supported on Three Rollers, and the Drive is Transmitted Through Steel Springs

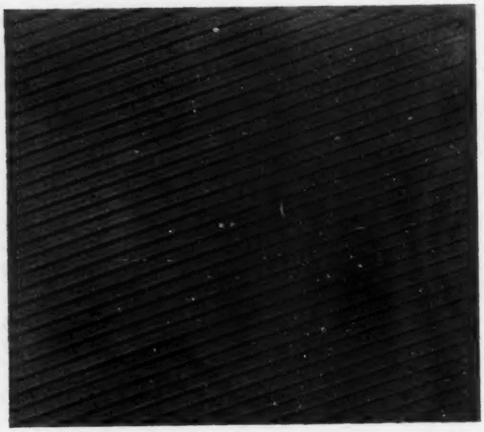


Fig. 3. Photomicrograph, at About 250X Magnification, of the Surface of a Flat Plastics Disc Machined with a Diamond Tool on the Precision Lathe, Showing the Uniform Groove Width from which the Very Low Value for Axial Spindle Movement can be Deduced

radial accuracy to be achieved has been developed in the Laboratories, and a sectional view of a lathe headstock incorporating such bearings is shown in Fig. 1.

The cross-sectional form of the bearing employed in this headstock is indicated at the right, and it will be seen that the spindle is supported by three similar equally-spaced surfaces. The bearing is of bronze and the internal supporting surfaces were accurately lapped to size with a tolerance of only 0·001 mm. The steel spindle has been finished to the same tolerance, and the clearance between the two components is such that a drop of 5 deg. C. from the temperature at which the combination is designed to operate, would cause seizure due to the difference in contraction of the two materials. At the rear end, the spindle is fitted with a piece of "improved wood" *A*, the outer end of which rests against a stationary metal thrust block *B*, the surface of the latter having been lapped plane and at right angles to the spindle axis to a high degree of accuracy.

The end of the spindle is held in contact with the thrust block with a constant force by means of a suction pipe which maintains a fixed pressure, below that of the atmosphere, in the closed compartment *C*. Axial adjustment of the thrust block can be effected with the aid of the micrometer sleeve *D*, and in this way the workpiece can be displaced by extremely small increments in relation to the tool. The low pressure in the compartment *C* also ensures that the spindle lubricant, which enters the housing at the opposite end, is effectively distributed. This distribution is essential for accurate radial support of the spindle. Problems associated with the close fit of the spindle are avoided by maintaining the bearing at a temperature of 30 deg. C., by means of an electric heating element.

To enable accurate results to be obtained, the transmission of vibration by the spindle drive must be avoided, and a special pulley, details of which are shown in Fig. 2, is therefore employed. This pulley is not mounted on the spindle but is carried on three rollers, equally-spaced round its circumference, and connected to projections on the spindle by means of springs.

As a test of the accuracy obtainable with this equipment, a flat plastics disc was machined with a diamond-tipped tool having a nose-radius of 0·02 mm. (0·0008 in.), which was fed at the rate of 0·0009 mm. (0·00035 in.). A photo-micrograph, at approximately 250 × magnification, of the surface thus produced, is shown in Fig. 3, and the grooves have a width of 0·0009 mm. Close examination of the photograph has shown that the groove width does not vary by more than 5 per cent. It follows that during the 5-sec. machining period, the axial displacement of the lathe spindle relative to the tool was not more than 10 per cent of the groove depth, which, by calculation, is approximately 0·00005 mm. Consequently, the axial displacement did not exceed 0·000005 mm. (0·2 micro-inches).

The lathe was also employed for machining a cavity resonator for 8·75 cm. wavelength, for high-precision measurement of the dielectric losses in solids. In machining this cavity, it was essential that local unevenness of the surfaces should be as small as possible in relation to the depth of penetration of the high frequency currents, which was about 0·001 mm. for the wavelength in question. Measurements of the quality factor of the completed cavity resonator confirmed that the unevenness of the machined surfaces was very small in relation to the penetration depth. Another operation carried out on this lathe is the machining of the aspherical correction plates of mirror cameras for X-ray fluorography.

PUBLIC SERVICE VEHICLE CHASSIS produced during the first three months of this year, including those for trolley-buses, reached a total of 2,626, of which 1,413 were produced for export. For comparison, the corresponding figures for the same period last year were 2,343 and 1,317, respectively.

Some Aspects of Czechoslovak Technical Education

Fig. 1. This Girl Student is Undergoing Practical Training at a Czechoslovak Technical School

The rapid post-war economic development of Czechoslovakia has necessitated a considerable expansion of the arrangements for technical education, the facilities, it is stated, having been increased sixfold, compared with the pre-war period. Today, technical training is provided for approximately 140,000 young people, and in addition, several tens of thousands of employed men and women study at technical evening schools. There are now more than 400 technical schools, divided into eight main groups, which cover medicine, agriculture, education, and music, for example, as well as the various branches of industry. The latter is served by some 300 schools organized in 17 sections, and 84 of the schools are concerned primarily with engineering.

Boys and girls who have successfully completed studies at the general educational schools up to the age of 14 years, enter the technical schools for a four-year course, at the end of which they must take an examination. The studies are closely connected with practice throughout, and it is stated, for example, that the pupils of an engineering school in Prague successfully designed refrigerating equipment for goods trains bringing foodstuffs from China. Girls form a proportion of the students in engineering technical schools, where importance is attached to workshop training (Fig. 1).

Tuition at all Czechoslovak schools is free, and students at the technical schools receive a scholarship according to the financial circumstances of the parents. The total sum devoted to this purpose in the school year 1957/8 is stated to have been 150 million crowns, or £7½ million at the nominal rate of exchange. The majority of the technical schools have hostels attached, at which, for a small fee, the student receives full board and lodging. A technical school with hostel facilities, recently built in Prague, is shown in Fig. 2.

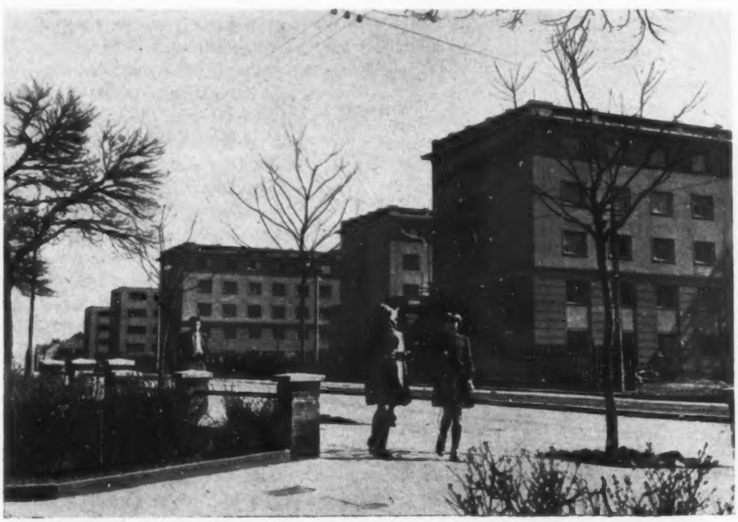


Fig. 2. A Technical School with Hostel Facilities Recently Built in Prague

Before the final examination is taken, the student receives notification from the authorities as to his or her future place of employment, together with details of the wages to be paid, and if the candidate is successful in the examination it is stipulated that he or she must remain in the job selected for at least three years. In this way, a steady flow of technically-trained workers to the various industrial districts is ensured.

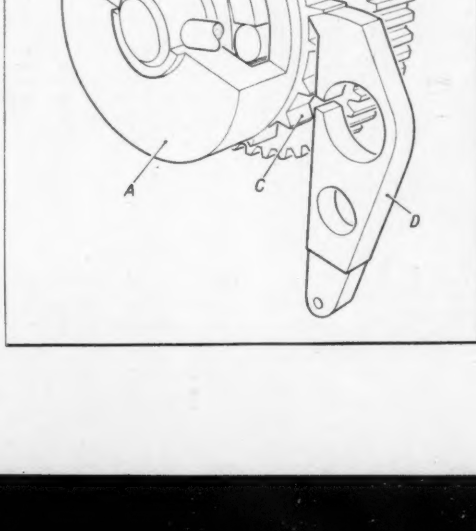
The social standing of the student corresponds closely with the social distribution of the population, and in the year 1957/58 about 63 per cent of the students were the children of factory workers or farmers. The average number of students per teacher is 30, and in 1956/57, there were 1,514 students at the technical schools per 100,000 of the population.

As in the case of the ordinary grade technical schools, the growth of the universities and advanced technical schools of university standing has been very rapid. Whereas, before the war, only nine universities existed in Czechoslovakia, there are now 40 establishments considered to be of university status. The number of students attending universities and colleges before the war is stated to have been less than 19,000, but now about 80,000 are either attending full time, or are studying in the evening or by correspondence courses. Some 36,000 students are taking technological subjects. University tuition is free, and scholarships are awarded to cover living expenses.

University courses also include a period of practical training in the industry concerned, and diplomas are granted upon the submission of a thesis. The subjects for the latter are carefully chosen in collaboration with the factories, as well as the various scientific and research institutes. It may also be noted that experts with practical experience in industry are chosen as members of the state examination commission which judges the work of the students. Like students from the technical colleges, university graduates are notified of their future places of employment, and the pay they are to receive.

Tiltman Langley Roller-type Clutch

A clutch of new design, the principle of which is shown by the accompanying perspective drawing, has been introduced by Tiltman Langley, Ltd., Redhill Aerodrome, Surrey. Of small dimensions, this clutch is intended for applications where robustness is important, and it will transmit about 0·5 h.p. at speeds up to 1,500 r.p.m., depending on the nature of the load. It is stated that it will operate with equal efficiency at temperatures down to -40 deg. C. or under tropical conditions.



As illustrated, the housing *A*, which is the driving member, rotates in a clockwise direction, and when the control wheel *C* is held stationary, by the pawl *D*, it prevents the rollers from being forced into the wedge spaces between the housing and the cam, *B*. This pawl can be arranged for operation mechanically or by a 7-watt solenoid.

When the pawl is withdrawn, the control wheel is caused to move clockwise, due to the friction of springs interposed between the housing and the cage, the latter being integral with the wheel. As a result, the rollers are moved into engagement with the cam, which is secured to the output gear. Re-engagement of the pawl arrests the control wheel, and the rollers are " kicked " out of engagement.

Clutches can be supplied with various arrangements for mounting the pawl and solenoid, to suit the direction of rotation and installation requirements. There is also a wide choice of standard gears, and special gears can be provided to order.

Perspective View Showing the Principle of the Tiltman Langley Roller-type Clutch

Notsa Engineering New Measuring Room

An important addition to the precision engineering and toolmaking facilities of the Notsa Engineering Co., Ltd., Aston-on-Trent, near Derby, has been made by the establishment of a well-equipped measuring and standards room, which has been granted certificates of approval by the A.I.D. and the Air Registration Board. As well as serving the needs of the company, this development enables a high-class metrology service to be offered to other firms which may be interested.

Société Genevoise instruments installed include a type MU-214B universal measuring machine which incorporates precision scales and micrometer microscopes reading to 0·00005 in. The measuring range is 16 in. longitudinally, 4 in. transversely, and 6 in. vertically, and among the equipment is a circular dividing table and a goniometric microscope for measuring angles. There is also a Société Genevoise type MUL-250 shop gauge measuring machine, fitted with precision scales and micrometer microscopes, for which a full range of accessories is provided. For making comparative measurements, there is a type MI-6B high-precision micro-indicator, suitable, for example, for the inspection of gauge blocks, reference discs and plugs, and balls and ball guideways. A magnification of 10,000 × is provided by optical and mechanical means, and readings to 0·000005 in. are observed on a graduated scale with luminous index which eliminates parallax errors. The measuring range is ±0·00025 in. and the total plunger travel, 0·08 in. Three different measuring tables, mounted on an indexing turret, readily enable a wide variety of workpieces to be handled. These three instruments are seen in the view of the standards room given in Fig. 1, and it may be noted, that very shortly a Société Genevoise type MUL-1000 universal measuring machine of 40-in. capacity, will be delivered, together with a type AP-6A profile projector. An OMT toolmakers' microscope, and Sigma mechanical and electrical comparators are in use.

Other important equipment includes a Taylor-Hobson Talyrond Model I roundness measuring machine, and a Talysurf Model 3 surface measuring instrument, which are seen in Fig. 2. On the Talyrond machine, internal and external diameters up to 12 in. can be checked, and workpieces up to 18 in. high are accommodated. An electric displacement indicator, carried on a spindle which is accurate to 0·000003 in. for centre of rotation, is moved round the stationary workpiece, and the signal from the indicator is amplified and fed to a polar co-ordinate recorder whereby straight radial ordinates are marked on an inkless Teledeltos paper chart. Provision is made for suppressing, if desired, the record of closely-spaced irregularities, to enable the general shape of the specimen to be more easily assessed. Conversely, the record of the general errors can be filtered out to facilitate study of the local irregularities. The use of Barrymount

Fig. 1. S.I.P. Precision Measuring Instruments in the New Standards Room of the Notsa Engineering Co., Ltd.

[Cementation (Muffelite) Ltd.] anti-vibration mountings for this Talyrond machine may be noted.

For the Model 3 Talysurf instrument which is installed, datum and right-angle attachments are provided which considerably increase the range of application. The right-angle attachment enables the pick-up to be mounted at 90 deg. to the normal position so that surface finish measurements can be taken between deep shoulders, as found, for example, on crankshafts. With the datum attachment, profile graphs and average readings of straight and curved surfaces can be obtained with reference to a datum within the instrument, independently of the surface under test.

Fig. 2. Talyrond and Talysurf Instruments in the Notsa Standards Room

Every effort has been made in the design of this new standards room to ensure the correct conditions for fine measurement. The temperature is maintained at 68 deg. F., within ± 1 deg., by a plant installed by Mellor Bromley (Air conditioning), Ltd., Leicester, which incorporates the necessary features of air filtering, humidity control, heating, and refrigeration. The wood block floor is laid on 2 ft. 6 in. of concrete to reduce vibration. Natural lighting is provided by double-glazed windows, and a high standard of uniform artificial lighting by concealed ceiling fittings.

The facilities to which attention has been drawn are noteworthy in that the Notsa Engineering Co., Ltd., is a relatively small firm, employing about 70 people at the present time. The same policy with regard to high quality and precision is followed by the company in selecting machine tools for production, and the extensive jig boring section is worthy of mention. Here, the equipment now installed comprises a Société Genevoise 2PH and 3K, a Newall No. 2442, a Matrix No. 50, a Hauser IA, a Devlieg 2B36 Jigmil, a 4B72 Jigmil of 48- by 72-in. capacity, and two Moore No. 2 grinders. Within the next few months, delivery is expected of several more jig borers, comprising two Newall type 24360P, with optical setting facilities, a Newall Spacematic equipped with the B.T.H. automatic positioning system, a Société Genevoise 6A Hydroptic, fitted with the D.S.I. automatic positioning system, and a special Société Genevoise Hydroptic No. 7P, with a height capacity under the spindle of 5 ft. 9 in., instead of the normal 39⅜ in. With these additional machines, the company claim they will have one of the largest and best equipped contract jig boring departments in the country, and it is anticipated that the installation of the automatic positioning jig borers will enable them to undertake batch production work of high precision very efficiently.

TECALEMIT QUICK-FIX AIR-LINE COUPLER—A new air-line coupler, known as the Quick-Fix, has been introduced by Tecalemit, Ltd., Plymouth, Devon, to facilitate the connection and disconnection of air-operated equipment from supply lines without waste of compressed air. For coupling, it is only necessary to insert a connector into the coupling unit and press it home. Steel balls, in the coupler, then serve to lock the connector in position to ensure an air-tight joint. Disconnection is effected by sliding an outer sleeve along the body of the coupler to disengage the balls and release the connector. Connectors of this type can be supplied in ⅛-in. 27 t.p.i. and ¼-in. 18 t.p.i. sizes. The former are intended for use with air lines, and the latter for fitting direct to Tecalemit Balcrank jet power pumps.

Peenamatic Shot Peening Machine for Forming Integrally-stiffened Wing Panels

In Fig. 1 is shown one of four Peenamatic travelling-carriage shot peening machines supplied by the Metal Improvement Co., 1721 East 47th Street, Los Angeles, California, U.S.A., to the Wichita plant of the Boeing Airplane Co., for forming integrally-stiffened light-alloy wing panels for aircraft.

Forming is carried out by the impact of 0·174 in. diameter shot which is directed against one side of the wing panel. As a result, the area of the peened surface tends to increase, and the workpiece is caused to bend and assume a convex shape. In this way, forming is carried out without the use of dies, and an important feature of the process is that residual compressive stresses are induced into both sides of the workpiece, with the result that improved resistance to stress corrosion and corrosion fatigue is obtained.

The Peenamatic machine will handle wing panels up to 84 ft. long by 7 ft. wide, with a maximum skin thickness of ⅝ in. Forming can be carried out on panels of tapered or irregular plan shape, tapered in thickness, and with various openings. Areas on which shot peening is not to be applied are masked by rubberized tape, as shown.

Made from ¼-in. thick steel plate, the 96-ft. long work table comprises four sections bolted together, and is inclined at an angle of 30 deg. to the horizontal, so that spent shot is discharged by gravity from the lower edge. Plastics-covered 1½-in. diameter tubes for supporting the work are mounted crosswise on the upper surface of the table at a centre distance of 4 ft. Guide rails secured to the shop floor at both sides of the table support the 12-ft. long peening carriage, which can be traversed at steplessly-variable speeds ranging from 6 to 60 in. per min. Rapid power traverse at the rate of 40 ft. per min. is also provided. Drive for the traversing motions is taken from motors through reduction gear boxes mounted on the carriage beneath the operator's platform, and thence to a sprocket which engages with a fixed roller chain adjacent to one of the guide rails. Air-operated brakes are incorporated in the drive system. A close-up view of the carriage and part of a formed wing panel is given in Fig. 2.

From the storage hopper mounted on the carriage, the shot is fed by gravity through flexible hoses and gate-type valves, to a total of ten nozzles, adjustably mounted on a carrier which is reciprocated at right angles to the work table, as peening proceeds, by an air cylinder. The shot is propelled on to the work at high velocity by compressed air, which is delivered to the nozzles by way of separate pressure regulators and hand-operated valves. Gauges are fitted to facilitate setting the pressure of air, and, consequently, the peening intensity for each nozzle, independently.

Fig. 1. Peenamatic Travelling Carriage Shot Peening Machine for Forming Integrally-stiffened Wing Panels

Fig. 2. Close-up View of the Peening Carriage of the Machine Shown in Fig. 1, with a Formed Wing Panel in Position on the Worktable. Spent Shot is Returned to the Hopper by Means of a Bucket-type Elevator

Compressed air is delivered to the pressure regulators through a solenoid-operated valve, a moisture trap, and a 2-in. diameter hose which is carried by a reel at the rear, and connected at one end to a swivel joint at a central position. A reel for supporting electric cable, also a dust collecting system are provided, and curtains are attached to both ends of the carriage to prevent the escape of shot to the atmosphere. Spent shot falls from the lower edge of the table on to a motor driven screw conveyor, and is returned to the hopper by way of a bucket-type elevator and a vibrating screen and " air wash " unit.

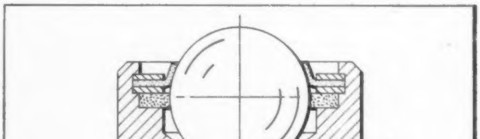
Autoset Omni-directional Conveyor Roller

In the figure is shown a sectional view of a re-circulating ball assembly recently introduced by Autoset (Production), Ltd., Stour Street, Birmingham 18, for use in ball tables.

The load to be moved is carried by a 1-in. diameter steel ball, which is supported by a number of $\frac{5}{32}$-in. diameter balls. The latter can circulate freely in a space between curved recesses in the 2-piece body and the convex and concave upper and lower surfaces of the case-hardened steel central member *A*. Nylon and felt sealing washers surround the large ball to prevent ingress of dust and dirt to the bearing balls.

As an indication of the very low frictional resistance resulting from this arrangement, it is stated that, for a test carried out by the company, four assemblies were mounted in a framework to support a cast-iron plate carrying a load of 8 cwt. It was then possible easily to move the plate—and with it the load—in any direction by hand, a finger pressure of 2 to 3 lb. only being required.

There are various forms of these assemblies available, including a flat, horizontal plate-fixing type, of 1-ton capacity, a screwed peg-fixing type of 700-lb. capacity, and a further design, which incorporates a nylon pad in place of the recirculating balls and has a rating of 100 lb. In addition, two further types, of 300-lb. and 5-ton capacity, are in the course of design. These omni-directional conveyor roller assemblies are the subject of a patent application.



Sectional View of the Autoset Omni-directional Conveyor Roller Assembly Showing the Main Load-carrying Ball and the Re-circulating Balls which Support it

Ultra-precision Grinding of Small Cylindrical Parts

Production grinding of small cylindrical parts to extremely close limits, and the simplified mating of such parts to equally accurate holes, without the need for lapping, are now possible as the result of a long-term research programme carried out in the U.S.A. by Brown & Sharpe engineers. This technique is being applied to the manufacture of accurately-fitting pistons and cylinders for fuel-injection systems, and will offer similar advantages for missile components and other precision work.

These operations are being carried out on Brown & Sharpe No. 5 plain grinding machines—as seen in the heading illustration—which have been refined by means of inspection and carefully controlled building techniques to reduce all alignment to the practical minimum. The machine is equipped with special carbide-tipped centres and an Electralign instrument for electronic alignment of the swivel table. Tempered spring-type mountings protect the machine from external vibrations, and means are provided for filtering the coolant and maintaining it at room temperature. Other features include a rapid traverse arrangement for the wheel-slide, an automatic cycle and spark-timing arrangement, and continuous infeed for plunge-cut grinding. The automatic cycle, spark-timing arrangement is not required, however, if the parts come to the machine round and straight, with carefully lapped centre holes, and only 0·0002 to 0·0003 in. need be removed to bring them to finished size.

Other factors contributing to the ultra-precise results obtainable are two recent B. & S. developments, known as Ceda/Size and Electromate. Ceda/Size provides a means of applying and controlling an extremely fine cross-feed, with an electronic-comparator caliper gauge riding on the work (Fig. 1), and an amplifier which registers changes in work diameter in increments of a few millionths of an inch. Wide-spaced graduations of 0·000010 in. are provided on the amplifier scale so that small changes in work diameter are readily observed. Setting and operation are simple, the procedure being as follows:

1. With the aid of the Electralign, a test piece is ground straight.
2. A master with the exact mean diameter to which the parts are to be ground, or an accurate sample of the part, is placed between centres.
3. The electronic caliper gauge is applied to the work and with the headstock spindle running and coolant flowing as in actual grinding, the knurled knob at the top of the caliper is adjusted to bring the indicator on the amplifier to zero. The machine is then ready to grind any number of parts on a production basis, size being duplicated within ±0·00001 in.
4. In operation, the workpiece is placed in the machine and the electronic caliper gauge is applied. The wheel is advanced to the grinding position, and the work ground until the amplifier indicates that the size is within about 0·000050 in. of zero. At this point, the Ceda/Size lever is depressed, with the result that an extremely fine grinding feed of millionths of an inch per work rev. is applied and controlled. When the indicator on the amplifier reaches zero, the work has been brought to finished size within 0·000010 in. and is round and straight.

An Electromate attachment is combined with Ceda/Size equipment when it is desired to grind pistons for mating with cylinder bores within close clearance limits. The Electromate includes a "computer-selector" unit on which the Ceda/Size

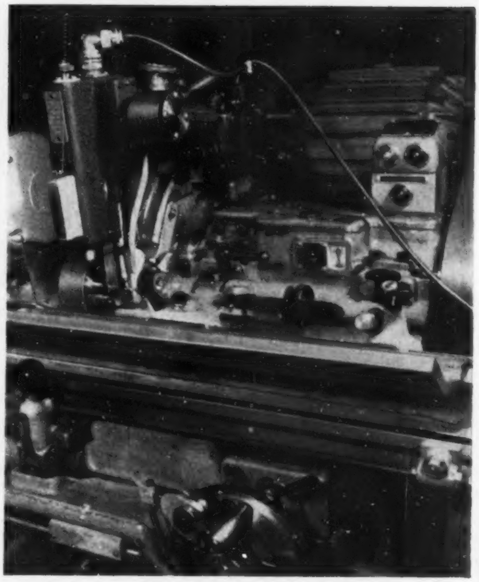


Fig. 1. With the Ceda/Size Method of Producing and Controlling Extremely Fine Cross-feeds, an Electronic-comparator Caliper Gauge Rides on the Workpiece

amplifier is mounted, as seen at the left in Fig. 2, and an auxiliary bore gauge, shown at the right. This gauge can be used to measure bores from $\frac{3}{16}$- to 1-in. diameter.

When grinding a piston to mate with a bore, accurate control of the desired clearance can be maintained to $\pm$0·000020 in. and these limits can be achieved even when the bores vary by as much as 0·0002 in. on diameter, but the holes must, of course, be straight and round. Wider variations in bore diameter are allowable if clearance limits between piston and bore are greater. For example, if the limits on the clearance are increased to $\pm$0·00005 in. then bore variations of as much as 0·0005 in. are permissible.

Selector switches on the computer-selector and amplifier permit exceptional adaptability for all types of precision grinding applications. With these switches, the dial on the amplifier can be arranged to indicate (with any desired increment value from 0·0001 to 0·00001 in.) the following:

1. The diameter of the piece which is being ground.
2. The diameter of a hole in a workpiece on the bore gauge.
3. The actual difference in diameter between a cylindrical piece being ground and the hole in a workpiece on the bore gauge with which the cylindrical piece is to be mated.

Plain cylindrical grinding machines, modified as described, and equipped with Ceda/Size and Electromate attachments, permit semi-skilled operators to:

1. Plunge grind parts to any predetermined size within $\pm$0·00001 in.
2. Plunge grind parts to any predetermined fit in a group of mating holes within $\pm$0·00002 in., without making individual measurements and calculations, even if the holes vary in size by 0·0002 in.
3. Perform fitting or finishing operations on a group of similar parts, removing as little as 0·00001 in. of stock or up to 0·0002 in. from each piece within an accuracy of $\pm$0·00001 in. Once the set-up has been made, the amount of stock removed from each part can be varied within the above limits depending upon individual requirements.
4. Take a part from the machine, measure it, replace it in the machine, and remove as little as 0·000010 in.

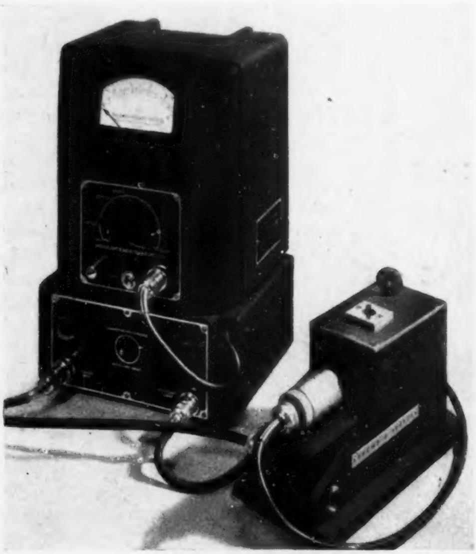


Fig. 2. The Electromate Attachment for Grinding Pistons to Mate with Bores Comprises a Computer-selector Unit and an Auxiliary Bore Gauge

Kendall & Gent 300-ton Plano-milling Machine

Fig. 1 shows the largest of three plano-milling machines which have been supplied to the Larne works of the British Thomson-Houston Co., Ltd., by Kendall & Gent, Ltd., Gorton, Manchester. It is being employed for machining large turbo-alternator parts and has a capacity for work up to 29 ft. 9 in. long, by 12 ft. wide, and 8 ft. 6 in. high. There are two vertical milling heads, and provision has been made for fitting a horizontal milling head, if required. In addition, an Asquith drilling and boring head is mounted at the rear of the cross-slide, so that milling, drilling and boring operations on the large workpieces can be carried out with a minimum of handling. Fig. 2 is a side view of the machine.

A description of one of the two machines previously supplied, each of which has a capacity of 18 by 6 by 6 ft., was published in MACHINERY, 90/991—3/5/57.

Weighing approximately 52 tons, the table is T-slotted, and a trough which surrounds the working surface collects the coolant for return to the tank. It has a total traverse of 31 ft. 6 in., and is 29 ft. 9 in. long, exclusive of the troughs, and 12 ft. wide overall. The rear end of the table has been prepared so that another table can be coupled to it to provide a tandem arrangement at some future date. This modification would necessitate lengthening the bed, and the extra lengths would be inserted between the existing bed joints.

Drive to the table is taken from a 30-h.p. motor with steplessly-variable speeds from 600 to 1,800 r.p.m. The motor is connected by flexible coupling and worm reduction to the gearbox, whence motion is transmitted by two long worms, set to eliminate backlash, which engage with semi-circular racks secured to the under-side of the table, end pressure in each direction being taken on heavy ball thrust washers. By means of the gearbox and motor speed variation, an overall range of feeds from ½ to 24 in. per min. can be obtained. When rapid power traverse is engaged, the motor operates at maximum speed only to give a rate of 15 ft. per min.

Electro-magnetic clutches are incorporated in the table feed-box to enable the feed or rapid traverse to be selected by push-button at the control desk or pendant. When the feed button is pressed, the appropriate clutch is engaged and the traverse motor is started simultaneously to move the table in the required direction, and at the predetermined feed rate. If the rapid traverse button is then depressed, the table is automatically speeded up to the constant rapid traverse rate.

Electric locking is provided for the table, and safety devices prevent the table traverse motor being started if the table is locked, or the spindle of the boring head being rotated if the table is not locked. As the combined weight of table and workpiece may amount to 80 tons, hydraulic assistance is provided for the hand motion.

Each milling head is driven by a 60-h.p. variable-speed motor, mounted on top of the head,

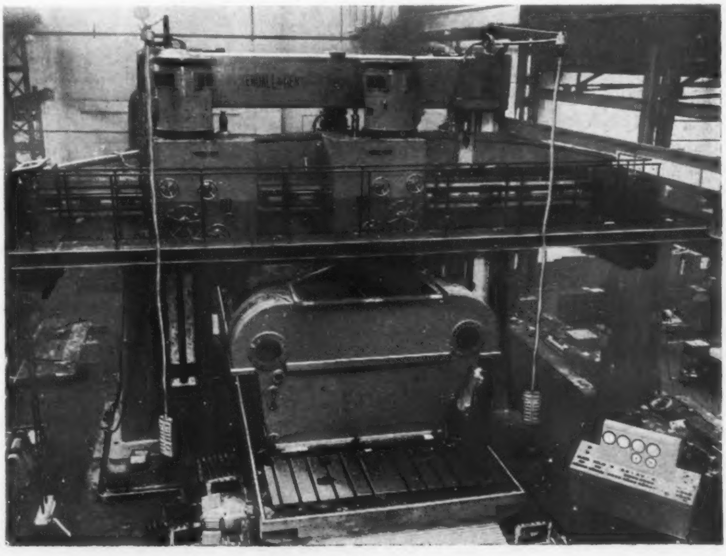


Fig. 1. Kendall & Gent 29¾ by 12 by 8½ ft. Plano-milling Machine

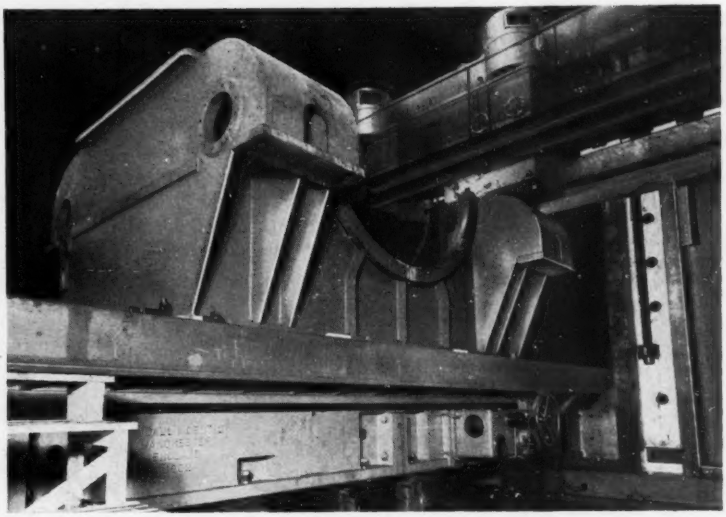


Fig. 2. Right-hand Side View of the Large Kendall & Gent Plano-milling Machine

which, in conjunction with a gearbox, provides steplessly-variable spindle speeds, in four ranges, from 6 to 220 r.p.m. The spindles, which have 6-in. diameter driving portions, are of high-tensile steel, and run in ball and roller bearings mounted in large-diameter densified iron sleeves. Each spindle nose has a 15-in. diameter flange, with driving keys, to receive large-diameter face milling cutters. A fine micrometer hand adjustment is provided for each sleeve, also power traverse, at 12 in. per min., by means of an independent 5-h.p. motor.

The milling head feed and rapid traverse motions are obtained in a manner similar to that described in connection with the table, drive being taken from a 15-h.p. steplessly-variable-speed motor, through a feed-box at the right-hand end of the cross-slide. Feeds range from ½ to 24 in. per min., and the rapid traverse rate is 5 ft. per min. Magnetic clutches, again, provide for the selection of feed or rapid traverse.

With an overall length of 36 ft., and a depth of 6 ft. 4 in., the cross-rail, with the milling and boring heads, weighs approximately 54 tons, and is partially balanced to facilitate elevation, which is effected by means of a 40-h.p. motor, at 15 in. per min. Should the cross-slide get out of alignment, owing to uneven wear of the elevating screws and nuts, a compensating clutch, incorporated in the elevating motion, provides means for correction.

When taking a cut, the cross-slide is locked in position by a 1-h.p. electric motor which drives a screw through worm gearing. Lights on the control desk indicate whether the cross-slide is locked or unlocked. In the former condition, electrical interlocks make it impossible for the elevating motor to be started.

Should the spindle motors be overloaded due to excessive depth of cut or feed rate, the table traversing motor or milling head traversing motor, whichever is in operation, is automatically slowed down. If the overload still persists when the motor has reached its lowest speed, it is stopped. This arrangement protects both the machine and expensive milling cutters.

In addition to push-buttons, the control desk is equipped with ammeters, reversing switches for the spindle motors, and large tachometer dials on which the actual feed traverse rates of the table and milling heads are registered. For use when close scrutiny of the work is necessary during cutting, two pendant push-button stations are provided, with buttons for all traverses.

The approximate weight of the machine is 300 tons, and the width between the uprights is 14 ft. 6 in.

PRODUCTION OF URANIUM FUEL PELLETS. At the Blairsville, U.S.A., plant of the Westinghouse Electric Corporation, large numbers of fuel pellets for atomic reactors are being produced from uranium oxide power. This powder is mixed with organic binders and is formed into small cylinders on an automatic press, which is enclosed by a plastics shield. Subsequently, the pellets are sintered to eliminate the organic constituents and obtain the required strength. As a considerable degree of dimensional accuracy is required, the sintered pellets are finished by grinding and are subsequently checked for length and diameter.

Finally,, the pellets are packed in stainless-steel tubes, in which they are a close fit, and the tube ends are sealed by welding.

Investigation of Chatter on Radial Drilling Machines

By W. BYE, B.Sc.

Chatter in machining operations is most readily avoided by care in the original design of machine tools. The problem is complicated, however, owing to the increasing speeds and feed rates now required, and the diversity of conditions under which many machine tools must operate effectively.

In modern machine tools, the natural frequencies of individual components are invariably well outside those encountered in service. However, as individual parts are combined in assemblies, the composite natural frequency inevitably falls. A cutting tool, moreover, must normally be mounted on a spindle or slide with the edge unsupported except by contact with the workpiece. In consequence, the assembly incorporating the tool normally has the lowest natural frequency of any part of the machine.

Dr. D. F. Galloway has reported[1] that with the arm of a particular radial drilling machine at the top of the column and the drill head at the outer end of the arm, resonance could be excited by vibrating the drill head in a vertical direction at a frequency of only 9·9 cycles per sec., and such a low natural frequency is by no means exceptional. The peak-to-peak amplitude of this vibration was 0·049 in. with an exciting force of only 20 lb. r.m.s., and the potentially serious effect of chatter on both accuracy and surface finish were thus clearly demonstrated. The importance of minimizing overhang was shown by the fact that the peak-to-peak amplitude of resonance was reduced to 0·00018 in. when the radial arm was lowered by 23 in., and the drill head moved towards the column through a similar distance.

[1] References at end of article.

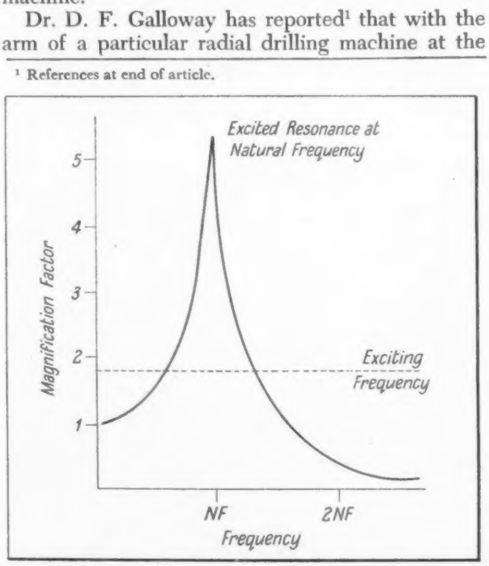


Fig. 1. Magnification Factor Plotted Against Frequency for a Simple Vibrating System. The Sharp Peak Indicates the Powerful Effect of Resonance Even when, as Indicated by the Dotted Line, there is Moderate Damping (Adapted from Galloway)

INDUCTION OF RESONANCE

The latent state of resonance only mainfests itself when it is excited by some vibratory force at the critical frequency. Fig. 1 shows the rapidly diminishing effect as the frequency of the exciting force diverges from the natural frequency of the vibrating system. Should the two frequencies be dangerously close together, it is possible to separate them by changing either the exciting frequency or the natural frequency of the appropriate portion of the machine tool.

Dr. S. A. Tobias and Prof. W. Fishwick[2] have done much to clarify the factors involved in adopting either of these two courses in connection with drilling operations. In many vibration problems outside the machine tool field, it is simple to vary the exciting frequency by changing the speed of the driving motor. When chatter is being excited as a result of vibration at the speed of the motor or of the transmission gearing, this course is also open to the machine tool designer. The above authors have, however, shown that the, in most instances, chatter, particularly at low frequencies, is induced as a result of vibration generated directly by machining.

In drilling operations, for example, discontinuity in the workpiece may result in variations in the rate of metal removal and in the effective rake angle. By reason of such a disturbance in drilling conditions, a time-dependent component may be

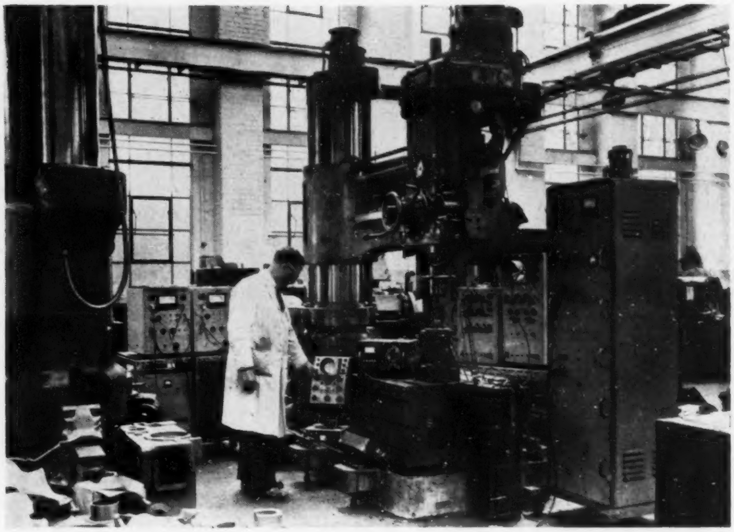


Fig. 2. General View of an Archdale Radial Drilling Machine Set up for Vibration Testing, Showing the Vibration Generator with its Power Source and Control Panel, Vibration Meter and Analyser, and Cathode Ray Oscilloscope for Checking Waveforms

superimposed on the normal constant thrust.

If the conditions are favourable to vibration, chatter induced in this way will become self-sustaining. For such favourable conditions to exist, there must be a specific relationship between the speed and feed in use, the natural frequency of the vibrating system, the effective damping coefficient of the machine, the thrust characteristics of the drill, and the machinability of the workpiece. The avoidance of chatter, therefore, depends on the elimination of any undesirable coincidence between these six factors.

For convenience, the implications will be confined in the following discussion solely to the important operation of drilling.

ACTION BY MACHINE BUILDERS

Progressive machine tool makers are concentrating more and more attention on the problem of chatter, partly on account of the increased speeds and feeds to which reference has already been made, but also because production engineers are now required to machine metals which would have been considered " unmachinable " only a few years ago. It must also be borne in mind that many machine tools which are being put into service today will still be in use in ten years' time.

Since drilling has been taken as an example, the procedure adopted, for the solution of this problem, by James Archdale & Co., Ltd., at their Worcester factory, will be considered. Research in this field is under the direction of Dr. Tobias, whose work on this subject has already been mentioned.

Broadly speaking, vibration testing is carried out by two complementary methods. With the first, machines are subjected to artificial loads, such as the simulation of drill thrust by means of an electromagnetic vibration generator, as shown in Fig. 2. The second method involves measurement of vibration at various points on the machine while drilling is carried out under closely-controlled conditions. Comparison of vibration readings obtained in both types of test enables spurious effects to be eliminated, and it is then possible to correlate vibrator testing unambiguously with normal working practice.

One of the main advantages gained with artificially-induced vibration is that any effects noted during drilling can be greatly magnified to permit study in greater detail.

VIBRATION GENERATORS

The vibration generator employed for this work is the Model 790 from the range supplied by Goodmans Industries, Ltd., Axiom Works, Wembley. It incorporates a heavy pot-shaped magnet assembly for producing the magnetic field in which a moving coil operates. The armature is a light structure which is suspended inside the heavy pot by means of two spiders, and can move freely in an axial direction, while radial deflection is prevented. Vibration is generated by supplying a sinusoidal current to the moving coil which forms an integral part of the armature. Due to the low axial restraint of the spiders, the armature describes a purely sinusoidal vibration at a frequency equal to that of the alternating current fed into it. The vibratory force generated in this way is directly

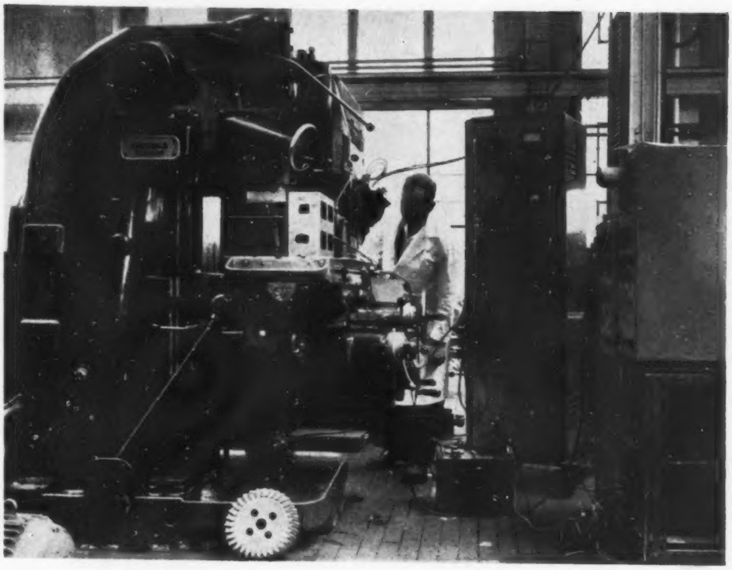


Fig. 3. The Power Source and Controls for the Vibration Generator are Housed in the Cabinet to the Right of the Operator. Here the Generator is Mounted on the Table to Apply a Horizontal Vibratory Force on a Vertical Milling Machine

proportional to the magnitude of the applied current.

For convenience, the current supply is taken from a valve oscillator, and a suitable heavy-duty unit can be seen to the right of the operator in Fig. 3. (This oscillator is an early model, and the latest version, known as the Type D120, is much more compact.) A knob, which is set with reference to a calibrated dial, controls the output frequency of the signal supplied to the vibration generator. Once this frequency has been set, it remains constant, irrespective of fluctuations of the mains supply or any other variable factor.

The current supplied by the oscillator to the generator can be varied by altering the gain, and once a setting has been made, the value, which is indicated on a sensitive meter, remains constant. Since the "force factor" of the generator (in lb. per amp.) is known, this meter can be calibrated in force, should this be desired.

The facility for varying the magnitude and frequency of the exciting force independently is important. It enables the force to be maintained at a constant value while the frequency is varied, in a few seconds, over the entire range.

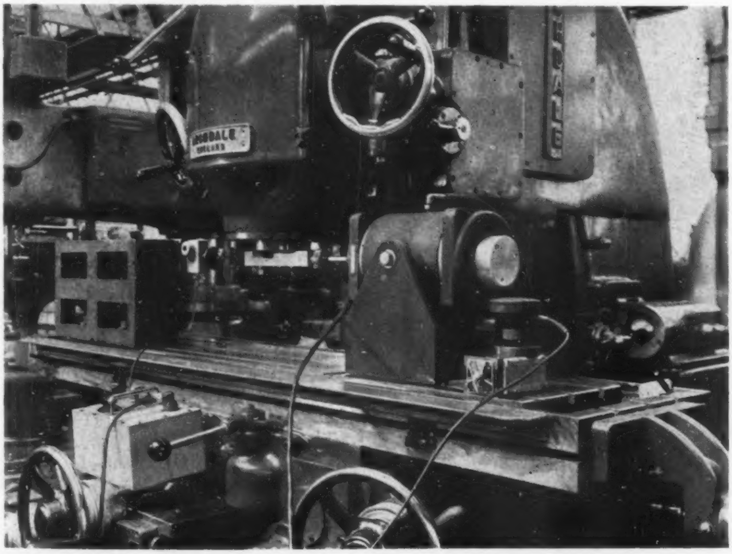


Fig. 4. A Close up of the Goodmans 790 Vibration Generator Adjusted to Apply a Horizontal Oscillatory Force. Attention is Drawn to the Use of a Magnetic Chuck to Hold the Pick-up for the Vibration Meter in Contact with the Machine Table

VIBRATION MEASUREMENT

For measuring the resultant vibration, a meter is employed which is connected to an inertia-type crystal pick-up by means of a flexible cable. The pick-up is mounted at any desired point on the machine, and the meter can be placed in any position convenient for the operator. Although the pick-up can be pressed into contact with the vibrating surface if only a single reading is to be taken, it is generally desirable to attach it positively, but temporarily, to the surface either magnetically, as seen in Fig. 4, or by means of a simple screwed mounting point (Fig. 5). With either method, the pick-up can be changed rapidly from the vertical to the horizontal position and is always presented in the same way to the surface, which is important if close repeatability is desirable.

MODES OF VIBRATION

Vibration of several radial drilling machines by the method shown in Fig. 2 has disclosed that they have two vertical modes and a number of horizontal modes. Experience suggests that this may be generally true for this type of machine.

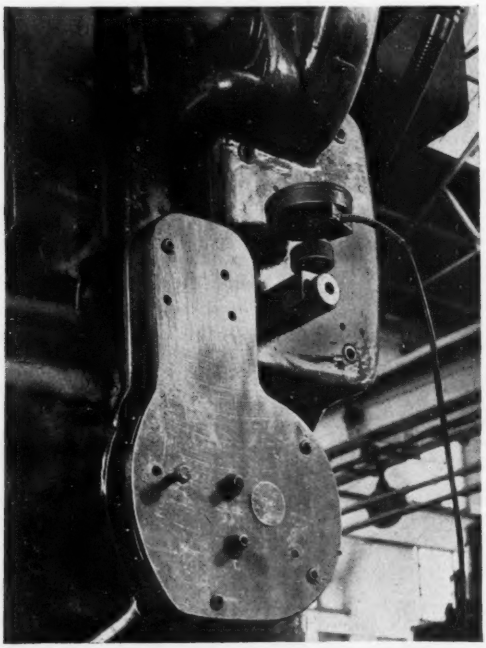


Fig. 5. A Simple Mounting Point for the Pick-up of the Vibration Meter. The Two Screwed Plugs Enable the Pick-up to be Changed Rapidly from the Horizontal to the Vertical Direction

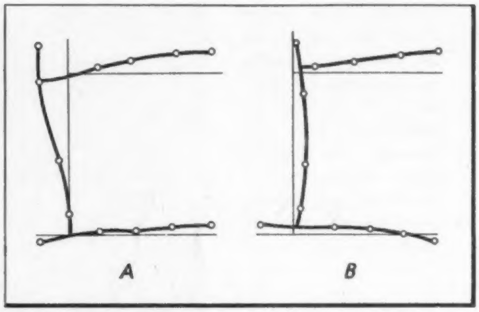


Fig. 6. There are Normally Two Vertical Modes of Vibration for a Radial Drilling Machine, Namely (a) the "Rocking Mode" and (b) the "Tuning-fork Mode." Experience has Shown that Chatter on Such Machines is Associated Purely with the Rocking Mode

The vertical modes, designated "rocking" and "tuning-fork," are indicated diagrammatically at *A* and *B*, respectively, in Fig. 6. The thin full lines in these illustrations (which represent the top surface of the arm, the centre of the column and the bottom of the base) are the datum lines for measurement. Readings have shown that these members deform under vibration, as indicated by the heavy lines. The actual amplitude of vibration is indicated by the distance of the circles from the datum line. For clarity, only one extreme position has been shown in each instance, the second being a mirror image on the other side of the datum line.

A typical resonance curve obtained by this method on a particular radial drill is shown in Fig. 7, the ordinates representing relative amplitude between the box table and the drilling spindle. The rocking mode of vibration associated with the sharp peak at 10·2 cycles per sec. can be shown to have a dynamic amplification factor of 14·5, whereas the flatter peak at 26 cycles per sec. (associated with the tuning fork mode) has an amplification factor of only 3·7. This substantial difference in the attenuation of the two peaks is reflected in a marked difference in the vibration in the two modes. The vertical rocking mode has an amplitude of more than 0·005 in. at resonance, whereas the amplitude for the tuning fork mode is less than a tenth of that value.

Although a number of different modes of vibration is theoretically possible in both the horizontal and vertical directions, it by no means follows that

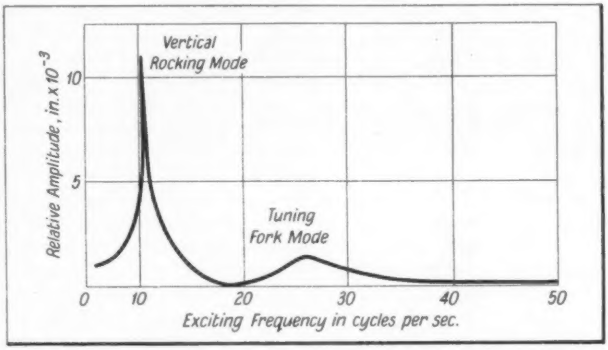


Fig. 7. Resonance Curve for a Typical Radial Drilling Machine which was Obtained by Vibrating Vertically with an Exciting Force of 20 lb. r.m.s. The Peaks Associated with the Rocking Mode and the Tuning Fork Mode (Fig. 6) can be Observed

all will be excited in practice. In particular, the radial damping exerted by the workpiece on the drill may be expected to suppress horizontal modes of vibration. Research shows that this deduction is correct and that horizontal vibration is of strictly limited importance when drilling. Since drilling tends to have the effect of separating the arm and the baseplate of a radial drill, it was originally supposed that the tuning-fork mode would mainly be excited in service. Experiments with drills ranging from ¼ to 1 in. diameter indicated that this supposition is incorrect, and that the vertical rocking mode is exclusively excited within the range of conditions studied.

PREVENTING CHATTER

On the basis of data obtained from such tests, it may be advisable to increase the dynamic stiffness of the structure so as to raise the natural frequency at which resonance takes place. For this purpose it is essential to know the extent to which different parts of the structure of the drilling machine are deformed. It is obvious that no increase in stiffness in undeformed parts can have any beneficial effect. On the contrary, by adding mass at inessential points, the ratio of stiffness to mass can be changed in such a way as to lower the natural frequency and thus to increase the incidence of chatter.

Conclusions can also be drawn from such tests concerning the possible steps which can be taken to avoid an undesirable correlation of the factors controlling chatter. Fig. 8 shows in graphical form the unstable (shaded) and stable (unshaded) regions for the radial drilling machine to which the curve in Fig. 7 relates. Another unstable region, associated with the tuning fork mode, is located to the top right of the diagram, and is innocuous. This type of diagram is characteristic of radial drilling machines, although the individual shape and detail will vary considerably, depending on the design of particular machines and the drilling conditions.

Since chatter will tend to occur whenever the operating conditions of the machine lie in the shaded area, it is possible to establish various arrangements which will prevent chatter from arising in a particular machine. For instance, if the value of Q_e (critical damping/2 × effective damping) for the mode of vibration is less than 12, the locus for Q_e will never intersect the unstable area at any drill speed. Operation will thus be stable under all conditions and chatter will never occur. In practice, the true

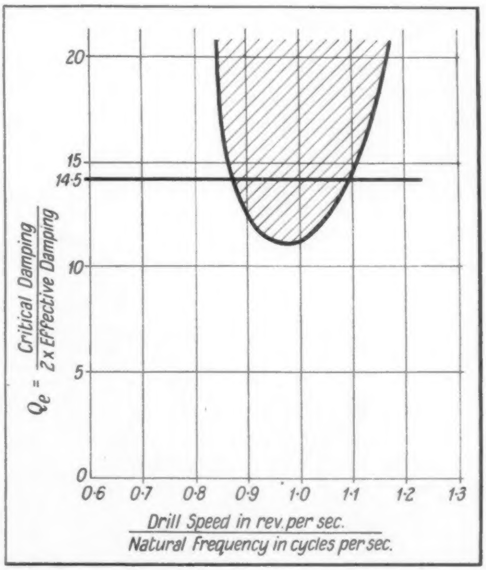


Fig. 8. Typical Stability Chart for a Radial Drilling Machine with the Vibration Characteristics Shown in Fig. 7. The Line for Q = 14·5—representative of the Rocking Mode—Intersects the Curve Indicating Instability in the Rocking Mode for Abscissae between 0·87 and 1·1 (i.e., for Speeds Between 530 and 675 r.p.m.)

value of the effective dynamic amplification factor (Q_e) is difficult to compute. For general purposes, however, it is sufficiently accurate to assume that it is equal to the dynamic amplification factor (Q) of 14·5, which can be calculated directly from Fig. 7. Accordingly, a horizontal line is drawn through this value to pass through the unstable curve for values of drill speed from 530 to 675 r.p.m. Confirmation of the essential correctness of the method was obtained from the fact that chatter was self-propagating over the entire band when the practical conditions were made to simulate those used in the construction of Fig. 8.

CONCLUSIONS

It is now possible to predict, within fairly close limits, whether a drill will cause chatter under a given set of conditions. This knowledge is of value in that it enables conditions liable to cause chatter to be avoided. Of more fundamental importance is the advance warning given to designers of the effects of proposed constructional changes. Practical drilling tests are important guides to future action, but they supply data only for the conditions actually reproduced under test. The great value of simulated tests with a vibration generator replacing the drill is that the entire range of working frequencies ever likely to be encountered in practice can be investigated in a very short time. It is impossible to leave an unexplored gap through inadvertently failing to visualize particular conditions to which the machine will be subjected.

The method of simulated testing described above is not confined to radial drilling machines. It is a universal method applicable to all machine tools. For instance, Fig. 3 and 4 show vibration generators mounted on a vertical milling machine, and similar methods of testing can be applied to a lathe or grinding machine.

[1] D. F. Galloway, B.Sc. (Eng.), Ph.D., Wh.Sc., M.I.Mech.E., M.I.Prod.E., in a paper "Some Experiments on the Deflections and Vibrations of Drilling Machines" read before the Institution of Mechanical Engineers.

[2] S. A. Tobias, D.Sc., Ph.D., and Prof. W. Fishwick, Ph.D., in a paper "Vibrations of Radial Drilling Machines under Test and Working Conditions" read before the Institution of Mechanical Engineers.

Stack-A-Jack Clamp Supports

The Stack-A-Jack packing pieces for machine clamps, recently placed on the market by T. Cowley, 116 Coleman Court, Kimber Road, London, S.W.18, are available in sets, each comprising 80 items, which are housed in a wood case with a plastics insert, as shown in the figure.

Presented in this manner, the various items, which are accommodated in pockets in the insert, can be quickly selected with reference to a chart on the lid, and assembled to provide a maximum of four packing pieces with heights ranging from $\frac{11}{16}$ to $4\frac{21}{32}$ in. in $\frac{1}{32}$-in. steps. An example of a packing piece which has been built up from a number of items is seen in the foreground.

The set comprises $1\frac{1}{4}$-in. diameter by $\frac{9}{16}$-in. thick base members, and $\frac{7}{8}$-in. diameter "stem" and "cap" pieces, the former having lengths, over the contact surfaces, of $\frac{1}{2}$, 1, and 2 in., and the latter, thicknesses ranging from $\frac{1}{8}$ to $\frac{19}{32}$ in. Made from steel, case hardened and cadmium plated, the items are knurled, to facilitate handling, and when assembled they are located in relation to each other by mating spigot portions and recesses. Since the various parts are held to limits of $\pm 0{\cdot}002$ in. for length over the contact faces, they may be used, if desired, for supporting stepped parts.

The equipment is also available in sets comprising 40 items, which enable a maximum of two packing pieces up to $4\frac{21}{32}$ in. high to be built up. Alternatively, the pieces can be supplied in the requisite numbers without a case, and storage facilities are then provided by the user.

Stack-A-Jack Clamp Supports

Large Milling Cutters Designed for Ease of Maintenance and Setting

If sufficient thought is given to possible maintenance problems during the tool design stage, most of the problems can be anticipated and minimized. However, if maintenance is not considered during design, savings that are expected to result from the use of the new tooling equipment may turn into losses.

As an example, it may be noted that large-diameter face-milling cutters which were designed by the Wesson Co. for installation on an aluminium-billet scalping machine developed by the Consolidated Machine Tool Division, Farrel-Birmingham Co., Inc., have enabled blade grinding time to be reduced to only a few hours, whereas formerly three weeks was required. Because the blades are pre-set, set-up time has been reduced to 45 min. in contrast to the 12 to 15 hours formerly needed. In addition, gauges and setting fixtures, valued at 13,000 dollars, that were originally employed, are no longer necessary.

The scalping machine was designed specially to reduce the time required to prepare rough aluminium billets so that they can be cold-rolled into sheet, strip, and foil. A conventional machine has a single cutter, and each billet must be passed across it twice. Floor-to-floor scalping time on such machines is between 8 and 10 min., depending on the billet size. Moreover, handling of the billet between passes frequently resulted in scratches on the finished surfaces, which had to be removed by further milling. If such scratches go undetected, long blemishes appear in the finished material, and in either event, such damage is costly.

On the new duplex scalping machine, both sides of the billet are milled at the same time in a floor-to-floor time of about 90 sec. Average stock removal rate is 5,000 cu. in. of aluminium per minute. The first of these scalpers has been installed at the Ravenswood, W.Va., U.S.A., plant of Kaiser Aluminum & Chemical Co. The blades of the cutters rotate at a surface speed of 11,800 ft. per min., and act like fan blades inside the shrouds. A strong down-draught is thus generated, which throws the chips on to a conveyor in a pit below the machine.

Stock removal rates are adjustable by changes in the billet feed rate or the depth of cut, or both. Depths of cut may be as much as ⅜ in. on billets ranging in size from 8 to 16 in. thick, 30 to 54 in. wide, and 6 to 14 ft. long. Much power is required to remove chips at a rate of about 1 ton in 4 min. Each cutter is bolted to a direct-drive spindle powered by a 1,000-h.p., 600-r.p.m. electric motor. Jordon-type couplings are used so that the cutter heads can be adjusted longitudinally, either independently or simultaneously. The total travel for each cutter head is 17 in., and

Fig. 1. With the Back Wedges Secured to the Individual Tool-blocks, the Lower Wedges are Positioned and Locked in Place by Bolts

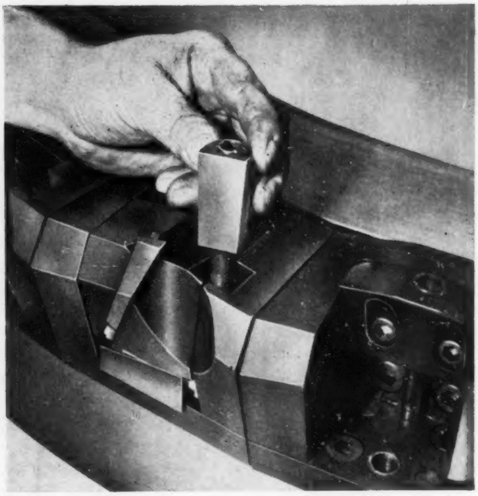


Fig. 2. Each Blade Holder is Retained in the Tool-block by Means of a Single Wedge that Exerts Force in Three Directions Simultaneously

adjustments can be made from the main console in increments of 0·01 in.

CUTTER DESIGN

Each of the cutters designed for this billet scalper weighs about 2 tons and has an effective diameter of 75 in., and it is believed that they are the largest pre-set, carbide-blade, face-milling cutters ever made. Each cutter has 44 Wessonmetal solid-carbide roughing blades and two solid-carbide finishing blades.

A segmented design was adopted to permit the very substantial savings in maintenance time. Blades are ground after removal from the cutter body, but they can be quickly and accurately re-assembled. Each cutter comprises a solid-steel body ring to which 44 hardened steel blocks are bolted. Each block is located angularly by means of two dowel pins, and identical, removable blade holders are fitted to the blocks.

Incorporated in each block are two tapered wedges for radial and axial adjustment of the blade holder. These wedges need to be set only once during the life of the cutter. Also, once the wedges have been positioned, any holder will be correctly located as soon as it is inserted and locked.

Outside diameter location of the cutting edges is achieved by adjusting back wedges in the tool-blocks. The height of the cutting edges is adjusted by lower wedges, which are correctly set in the blocks by means of a master holder. In Fig. 1, one of the lower wedges is seen being locked in place with a bolt. In this illustration, the back wedges are shown secured to the tool-blocks.

Each blade holder has a tapered slot that holds the solid carbide blade with high, positive radial- and axial-rake angles. The holder in each block is secured by a single self-actuating wedge, seen in Fig. 2, which exerts locking forces in three directions at the same time. Each of these units is actually an assembly of a wedge and a bolt. When the bolt is turned clockwise, the wedge is drawn down to tighten the assembly; and when it is turned counterclockwise, the wedge is loosened.

HOLDERS DETERMINE CUTTING ANGLES

The design of the holder is the key to the important reductions in grinding and set-up times. Incorporated in each holder are the angles that ensure the required clearance for the blade when the unit is inserted in the block. Only a simple gauging set-up, illustrated in Fig. 3, is needed. Two dial indicators are used—one for checking the distance of the cutting edges from the centre of the cutter body within 0·001 in., and the other

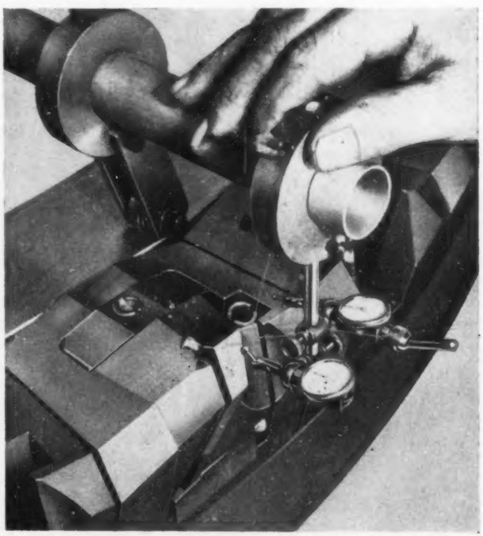


Fig. 3. One Indicator is Used to Check the Distances of the Cutting Edges from the Centre of the Cutter, and the Other to Check the Heights of the Blanks

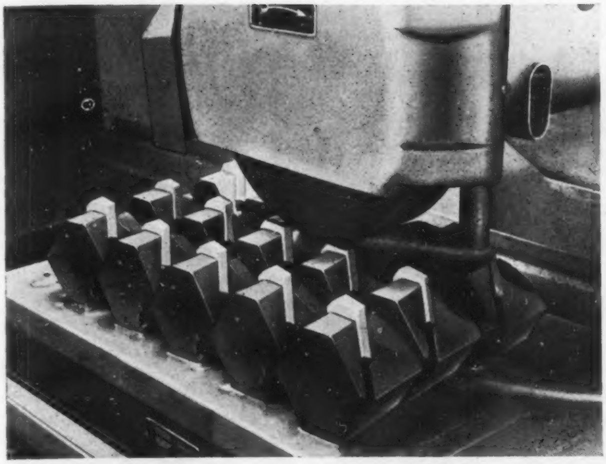


Fig. 4. Resharpening Carbide Blades for the Large Face-milling Cutters is Simplified by Using the Blade Holders as Fixtures on a Surface Grinding Machine

for the height, which is maintained within 0·003 in. The indicator support arm is provided with a ball-bearing, roller type steady-rest which bears on the cutter body.

Since the compound angles required on the blade are actually determined by the holder, the latter can be used as the blade-grinding fixtures during resharpening. Consequently, the complicated angles can be ground on an ordinary surface grinder, as seen in Fig. 4. It is only necessary to remove the blade holders from their blocks on the cutter ring, position them on a magnetic chuck, and grind until all the blades have been sharpened.

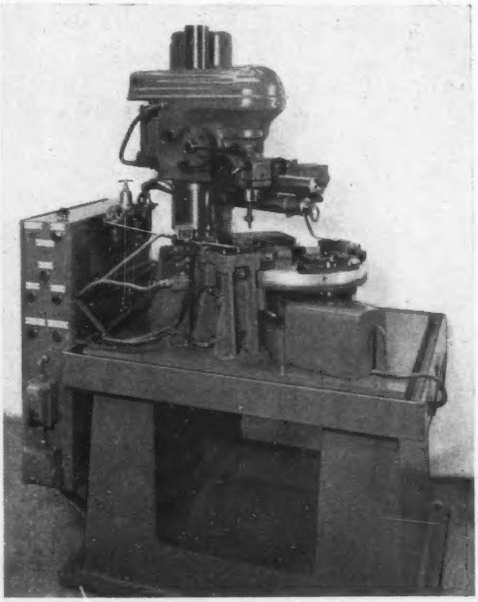
Complete sets of right- or left-hand blades can be ground at one machine loading, and, if necessary, right- and left-hand blades can be ground in mixed loads. As many holders can be mounted on the surface-grinding machine as the magnetic chuck will hold, and relocation in the cutter is a simple matter.

Pacera Automatic Machine for Chamfering Ring-shaped Parts

W. J. Meddings, Ltd., 16 Berkeley Street, London, W.1, have recently supplied the Pacera automatic drilling machine, here shown, to a German firm, for chamfering at one side only, the bores of ring-shaped parts.

The 4-station indexing table carries fixtures fitted with V-shaped jaws, which are automatically closed for gripping the work by the action of an air cylinder. Next, the table is indexed to bring the part to the working position, and is located, positively, while chamfering is being carried out. During this operation, the drill spindle is controlled by a Pacera-Maxam air-hydraulic feed unit, and coolant is delivered to the work in mist form. When the table has again been indexed, after the chamfering operation, the work is automatically ejected from the fixture. At the fourth station, swarf is removed from the fixture by compressed air. With this arrangement, a component may be loaded while other parts are being chamfered and ejected.

Electrical equipment and solenoid-operated air valves for controlling the working cycle, are housed in a separate floor-mounted cabinet. Provision is made for setting the machine by hand.

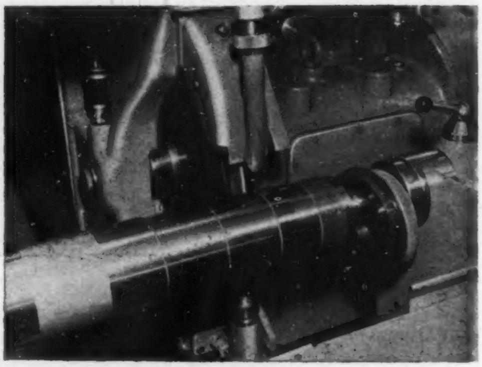


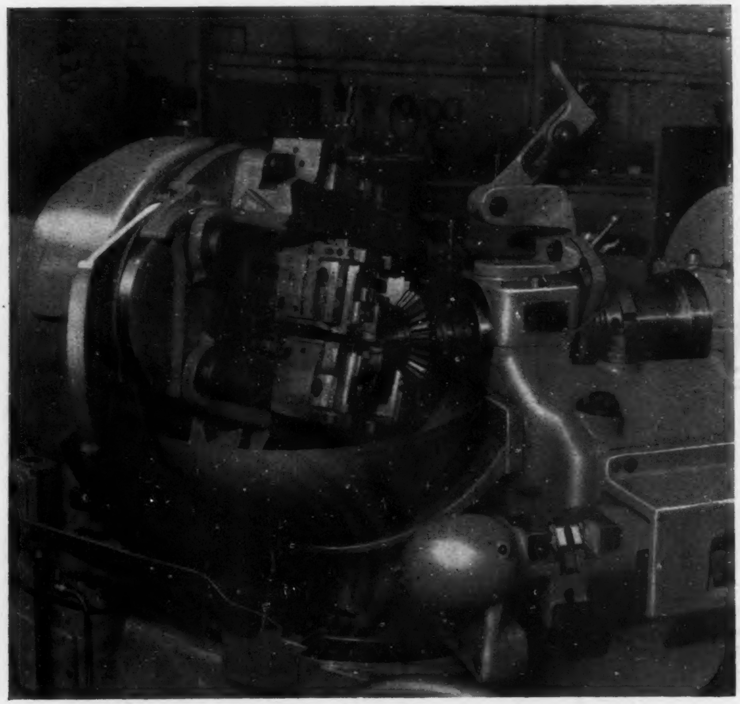
Pacera Automatic Machine for Chamfering Ring-shaped Parts

Round the Shops

Some Typical Operations at the Minganti Works, Bologna, Italy

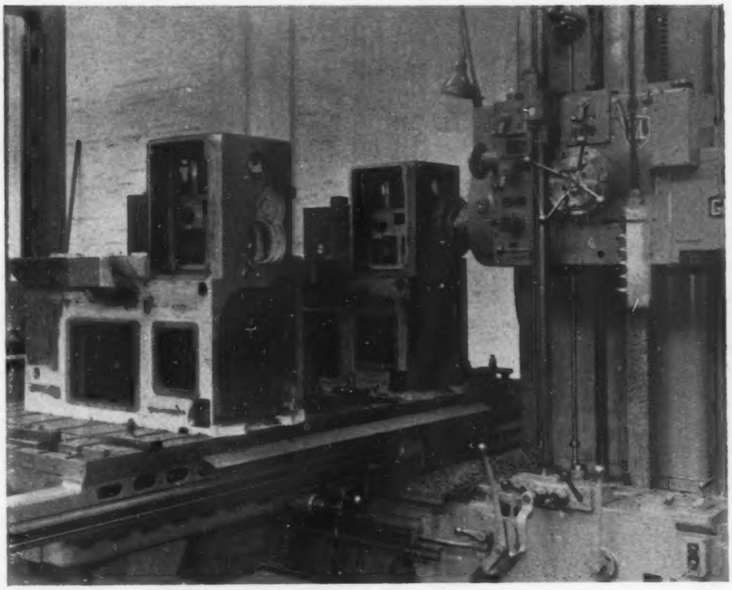
This Lindner (Stedall Machine Tool Co.) grinding machine is employed for all the important threads on such components as spindles tor Minganti machines. It is shown set up for operations on the main spindle for the type I/AP turret lathe, which has a 3-in. bore, and two ground threads at one end. The threaded portion in front of the grinding wheel is of 2-mm. pitch, 60-deg. metric form. It has an outside diameter of 105 mm. and is 30 mm. long. This thread accommodates tne spindle bearing adjustment nut in the final assembly



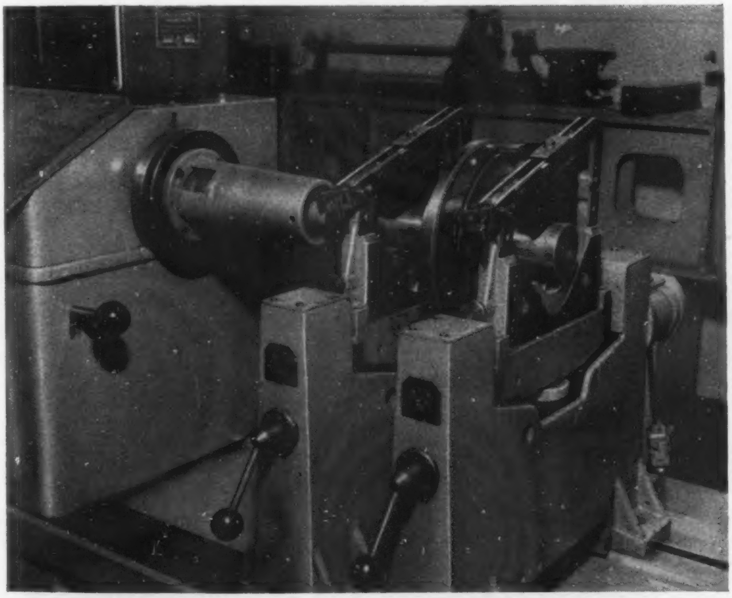


Practical tests carried out on Minganti bevel gear generating machines include the cutting of a sample gear. A DCM-306 machine is here shown set up for cutting a 45-deg. test gear of 140 mm. pitch diameter, with 28 teeth of module 5 and 20-deg. pressure angle. At the roughing operation illustrated, each tooth is cut in a period of 18 sec. The machine will cut gears up to module 8 with a maximum tooth length of 90 mm., and gear sets with ratios from 1:1 to 10:1 may be produced. The agents in this country for Minganti machines are Cyril Adams & Co. (Special Projects), Ltd., 70-74 City Road, London, E.C.1.

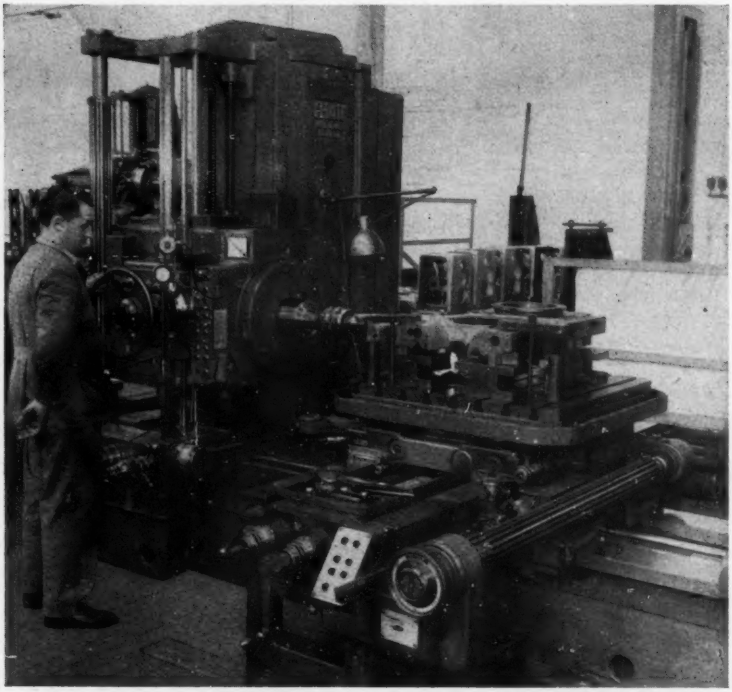
with a Camera



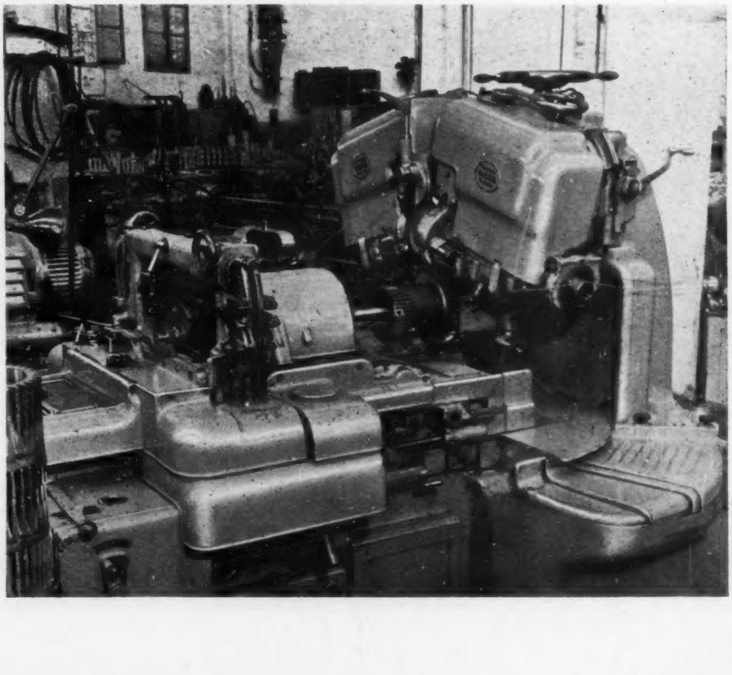
For milling the end faces of beds for Minganti T35 turret lathes, two castings are set up, as shown, on a Giddings & Lewis (Rockwell Machine Tool Co., Ltd.) horizontal boring machine. The 11·8-in. diameter Coromant cutter has 16 inserted carbide-tipped blades and is driven at a surface speed of 285 ft. per min. A feed rate of 6·5 in. per min. is employed, and for the roughing operation the depth of cut is 0·2 in. The spindle head is fed vertically and only two passes are required to machine the entire end surface of each casting



This Schenck (W. & T. Avery, Ltd.) dynamic balancing machine is employed for most of the spindle assemblies for turret and other lathes made by Minganti. Prior to assembly on the spindles, such parts as roller bearings, gears, and clutch sub-assemblies are separately balanced to reduce the amount of correction finally required. Here, part of a headstock spindle magnetic clutch is shown set-up for balancing. A lathe of the 80/100 series incorporates seven of these clutches for obtaining spindle speeds from 80 to 1,500 r.p.m., and six for feed changes



The set-up on a Ceruti Alematic ALF80 [Drummond-Asquith (Sales), Ltd.] machine is for a series of finish-boring operations on a turret lathe saddle, which has previously been jig-drilled. For boring the housing for the automatic feed mechanism, as shown, the spindle speed is 280 r.p.m., and feed, 0·004 in. per rev. Of 28-mm. diameter, the hole is 80 mm. long. On the Ceruti machine, the positions of the spindle head and the table can be pre-selected with the aid of stop drums, one of which is seen at the right of the table



Maag (Burton, Griffiths & Co., Ltd.) machines are among those employed in the gear grinding shop for finishing operations on gears for lathes and other machines. Here, a headstock spindle gear for a turret lathe of the 80/100 series is being ground. A roughing and a finishing operation are required, and the total time is $1\frac{1}{4}$ hours. Of 236-mm. pitch diameter, the gear has 59 teeth of module 4. The pressure angle is 20 deg., and the face width, 25 mm.

Camlock Tools with Tungsten Carbide Throw-away Tips

Hillcliff Hard Metals, 54 Woodland Street, Sheffield 6, in association with Marsh Bros. & Co., Ltd., Ponds Steel Works, P.O. Box 82, Sheffield, have introduced a range of lathe tools, fitted with throw-away tungsten carbide tips, which incorporate a clamping method of outstanding simplicity, that has proved extremely effective in extensive practical tests. These tools are the subject of a patent application, and typical examples from the range are shown in Fig. 1. They are at present being made in shank sizes of ⅝ and ¾ in. square, and ¾ in. wide by 1 in. deep, and two designs to take triangular and square tips are available. Square-tip tools can be supplied with approach angles of 5 deg. and 15 deg., and triangular tools with approach angles of zero and 15 deg. The shanks are so designed that one size of square tip, measuring ½ in. square by $\frac{3}{16}$ in. thick, and one size of triangular tip, of 0·4-in. inscribed circle by $\frac{3}{16}$ in. thick, suffice for the entire range of tools.

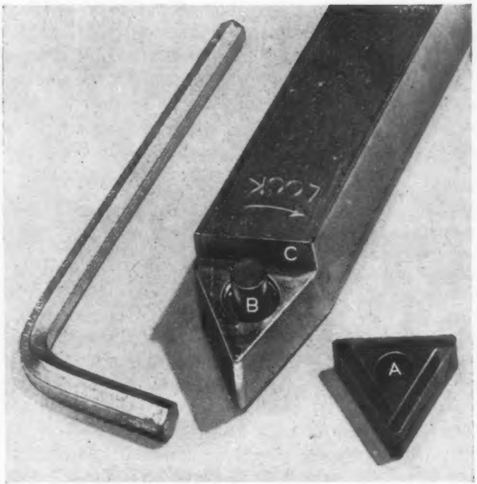


Fig. 2. The Tip is Securely Held in the Holder by the Locking Action of an Eccentric-ended Socket Head Screw

The method of clamping the tip can be seen in Fig. 2. A centre hole *A* is provided in the tip, which is engaged by the plain stem, *B*, of a $\frac{5}{16}$-in. B.S.F. socket head screw, machined eccentric to the thread by 0·040 in., to provide a cam locking action. The tip is merely held on the seating by finger pressure, and rotation of the screw in the tapped hole of the shank then securely locks it against the vertical step face. For tightening, the screw must be rotated in a clockwise direction when viewed above, so that it moves downwards, thereby ensuring that the tip is firmly seated on the shank. The shank, it may be noted, is of 0·4 per cent carbon steel, and is case hardened at the seating end to provide resistance against damage from swarf.

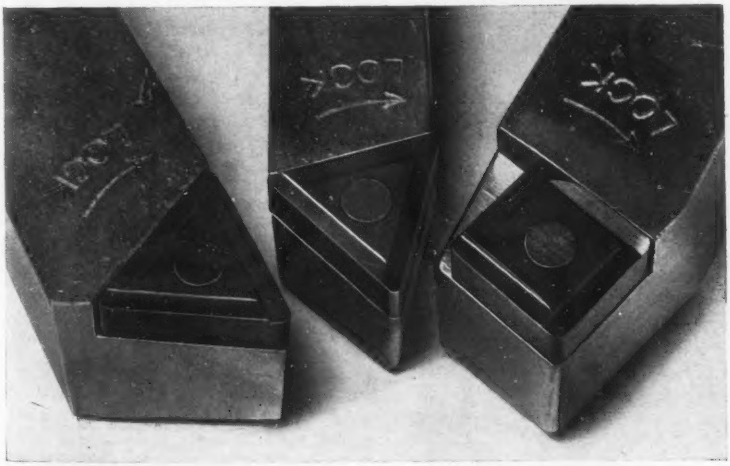


Fig. 1. Camlock Throw-away Tip Tools with Chipbreaker Grooves, Introduced by Hillcliff Hard Metals

Another important

feature of these tools is that chipbreaker grooves are formed in each face of the tips, so that the need for separate tool components for this purpose is avoided. The chip-breaker grooves, moreover, provide a positive rake of 8 deg. on the tip, and the shank seating for the latter is formed at a negative angle of 5 deg. Thus, a positive cutting rake of 3 deg. is provided on all the eight edges of a square tip, and on the six edges of a triangular tip.

The company makes tungsten carbide, and the tips for these Camlock tools are available in five grades. For machining plastics and free-cutting brass, for example, a Grade A tip is recommended, while Grade B is intended for cast iron and non-ferrous materials. Grades C and D are titanium tungsten carbides developed, respectively, for rough and finish machining steels. For finish machining steels at high speeds, also for carrying out roughing operations under good conditions, Grade E tips, which also contain titanium, are available. Tips of all grades can be supplied un-ground, or, if required, ground all over. It is proposed, very shortly, to extend the range of standard sizes, and special shanks to meet customers' requirements can be provided.

Fig. 3 shows a Camlock triangular-tip tool set-up for demonstration at the recent Production Exhibition, Olympia, on the stand of Marsh Bros. & Co., Ltd., in a Woodhouse & Mitchell 8½-in. centre lathe. With a Grade C tip, a cut ⅝-in. deep was taken on a 3-in. square, black bar of 0·90 per cent carbon steel, at a spindle speed of 480 r.p.m. and a feed of 0·013 in. per rev. On other occasions cuts up to $\frac{7}{16}$ in. deep were taken at a spindle speed of 682 r.p.m. and a feed rate of 0·017 in. per rev. This Woodhouse & Mitchell lathe is driven by a motor of 10 h.p.

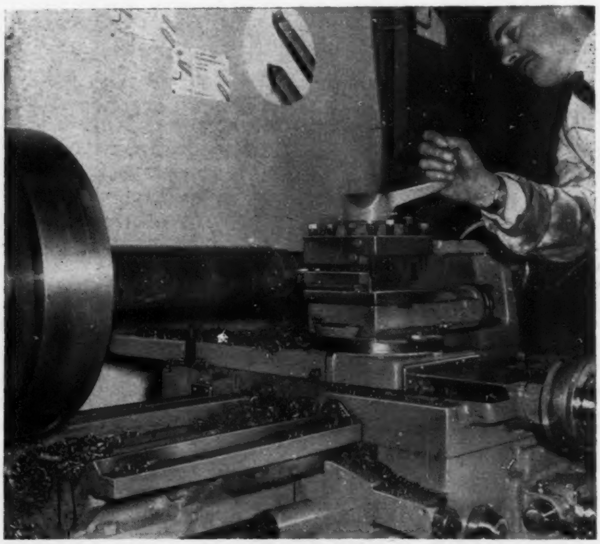


Fig. 3. A Camlock Tool Set Up for Demonstration on a Woodhouse & Mitchell 8½-in. Centre Lathe at the 1958 Production Exhibition Held at Olympia

Books Received

THE ANNUAL REPORT OF THE RURAL INDUSTRIES BUREAU, 1957-58. Rural Industries Bureau, 35 Camp Road, Wimbledon Common, London, S.W.19. 63 pp. [Price 1s. 6d.]

This book gives a comprehensive review of the work of the Bureau during the past year, with details of the instructional visits and courses which were provided. Sections are devoted, for example, to engineering, the experimental workshop, woodworking, and wrought ironwork.

STEEL REVIEW.—THE BRITISH STEEL INDUSTRY. The British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1. 64 pp.

This well-designed book provides a comprehensive description of the scope and activities of the British steel industry from all aspects. The text is contained in the centre section, and is flanked by reproductions of a large number of excellent black-and-white and colour photographs which have been taken at the works of some of the leading steel companies of the country. These illustrations are concerned with the major steel producing and working processes, also the applications of the finished product in its various forms. Copies of the publication can be obtained, free of charge, from the Federation at the above address.

NON-DESTRUCTIVE METHODS FOR THE EXAMINATION OF WELDS. British Welding Research Association, 29 Park Crescent, London, W.1. 78 pp. [Price 7s. 6d.]

The last of a trilogy which forms the B.W.R.A.'s handbook on non-destructive testing, this booklet (T. 29/1) replaces an earlier publication, No. T.29, which was first issued in March, 1952. Fully-illustrated with photographs and line drawings, it incorporates the results of recent research, and chapters are devoted to the radiographic, ultrasonic (and other acoustical), magnetic, penetrant, and gas leak testing methods, also the proof or overload test and semi-destructive methods. There is a glossary of terms used in radiography, and two appendices concerned with the defects in welds revealed by various methods of examination, and application of these methods to the different forms of welded joints.

News of the Industry

Leicester

Ex-Cell-O Corporation (Machine Tools), Ltd., are busily employed on home and export orders for both standard and special, precision fine boring machines. In a walk through the works, we noted a number of standard Junior and Senior types, both single- and double-ended, for a variety of operations. Special machines for the motor car industry include transfer types for machining differential carriers, and for 4-cylinder blocks, two at a time. Two 3-way machines, with inclined slides, are designed for subsequent machining operations on differential carriers received from the transfer machine, while two other 3-way machines, with inclined slides, are for boring and facing operations on the axle housings and banjo casings of rear axle assemblies. We also noted four machines for cutting bearing bores and spherical seats in differential cases, and four machines, two for semi-finishing and two for finishing, connecting rod bores.

Other interesting machines, to which our attention was drawn, are for fine boring brake drums, hubs and oil pump bodies, also for fine turning differential cases, turning and boring cylinder liners, and fine boring conveyor chain links, the latter machines having automatic hopper feeds. Two special 6-spindle machines under construction are for boring suspension arms, and two other large machines on order are for radial grinding operations on the roots of gas turbine blades. We also noted a 2-head machine for boring, facing and chamfering operations on starter ring gears. Two machines for operations on commercial vehicle axle arms and another for crankcases are being built for export to France. At a later date, it is hoped to make further reference to some of these interesting machines.

Spencer Gears, Ltd., are steadily occupied on a variety of gear-cutting work, which includes spur, helical, straight and spiral bevel, and worm gears, also racks. Other services provided are gear grinding, flame-hardening of gear tooth profiles, industrial paint-spraying, stove-enamelling, shot-blasting and metal-spraying.

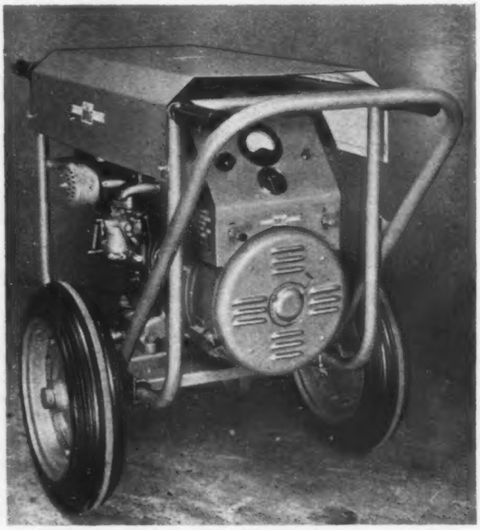
Percy Martin, Ltd., have an extensive and varied range of new and reconditioned machine tools available for immediate delivery from their Melton Road and De Montfort Street works.

J. W. Bamkin & Co. are engaged on the production of air-operated, automatic, universal single- and double-ended stud threading machines, cam-operated single- and double-ended stud threading machines, and tool and cutter grinding machines. Special machinery orders and sub-contract component assembly work are also in hand.

Burrows & Smith, Ltd., have a good programme of sub-contract orders in progress, comprising a large batch of Fellows gear shaping machines, which they are building for Alfred Herbert, Ltd., Coventry, and a variety of components for the diesel oil engine industry. Automatic loading equipment is being provided on some of the gear shaping machines.

Wyvern Machines, Ltd., are doing a steady

Recently supplied by Dale Electric (Yorkshire), Ltd., Filey, Yorks., to the British Transport Commission, this mobile battery charging unit has a rating of 24/32 volts, 62/47 amp. The 1·5-kW. shunt-wound generator is driven at a speed of 2,600 r.p.m. by a Villers 4-stroke, air-cooled engine, and output is indicated by a voltmeter and ammeter on the control panel. There is also a field voltage regulator, automatic battery cut-out switch, and a main switch. Weather protection is provided by a removable cover

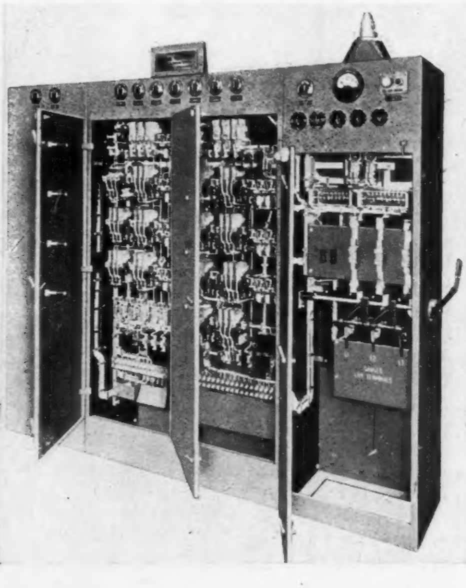


trade in 7½ and 8½ in. centre and capstan-type lathes, some of which are equipped with hardened steel bed slideways and hydraulic copying mechanism. On export account, we may note orders for Canada and South Africa. The associated TOMBLIN MACHINERY, LTD., have a variety of machine tool reconditioning work in progress.

RUDKIN & RILEY, LTD., report a good home and export demand for die shop machinery, comprising piercing and polishing equipment for the treatment of wire, rod and tube drawing dies. Export markets include Australia, New Zealand, South Africa and India. In addition, we may note orders in hand for the GKN spark erosion machine, electro-magnetic crack detectors, and precision internal and external cylindrical grinding machines. We hope shortly to describe a recently-developed coil spring end grinding machine and an internal grinder equipped with radius grinding attachment.

❖ ❖ ❖

The illustration shows a contactor-type switchboard fitted with magnetic overload releases, and signalling arrangements by means of coloured lamps, made by Erskine, Heap & Co. Ltd., Manchester, to the order of the Fairey Aviation Co. Ltd., for use on the Fairey-Ferranti tape-controlled milling machine described in MACHINERY, 92/932—25/4/58. This switchboard controls the power for the motor drive and sequences of operation initiated by the electronic system of the machine, and it incorporates 15 contactors of various sizes, 10 relays with associated interconnections, and a 400-amp isolating switch with high rupturing capacity fuses.



DECO MACHINERY, LTD., are doing a good home and export business in fine strip rolls, also spooling and drawing machinery. Our attention was drawn to an interesting attachment which has been developed for straightening wire prior to rolling or drawing. To facilitate the insertion of the wire between the upper and lower rolls, a single-lever, cam-operated mechanism ensures rapid opening and closing of the rolls, and it is hoped to make further reference to this in due course. Extensions now in progress at these works will add 3,500 sq. ft. to the floor space of the erecting shop. Recent additions to plant include two Ward No. 7 capstan lathes, an Archdale 4 ft. radial drilling machine, and a Jones-Shipman 40- by 10-in. cylindrical grinding machine.

HARBOTS, LTD., are experiencing a brisk demand for their precision hydraulic surface grinding machine, and orders are in hand from Canada, Australia, India and South Africa. It is hoped shortly to have available a surface grinder, equipped with a 10- by 18-in. table, to meet the particular needs of die and mould makers. A steady business is reported in slip gauges and machinists' gauge blocks, and other work in hand includes precision flat and circular form tools, profile-ground press tools, special milling cutters, comparators and gauges. An Archdale milling machine and Colchester and Harrison lathes have recently been added to the plant.

LEICESTER MACHINE TOOL CO. were occupied, at the time of our call, on a variety of machine tool reconditioning work, which included a Herbert No. 4 Senior lathe, a Ward combination turret lathe and a Kearns horizontal boring machine.

THE JAY-EFF FLAME HARDENING CO. are finding a well sustained demand for a variety of flame-hardening work by the Shorter process, and components are being treated in carbon and alloy steels, plain and alloy cast irons, Meehanite and malleable irons. Among the work recently treated we may note gears, cams, shafts, drums, rolls, levers, dogs, clutches, machine beds, slides and spindles.

H. C. PRETTY & SONS, LTD., report a satisfactory call for power transmission equipment, including belting, cast-iron pulleys and V-rope drives, and the repetition machining department is busily employed. The associated H. C. PRODUCTS, LTD., are finding a steadily widening application, particularly in the motor car industry, for the Task-master planning and progress system.

DALLOW, LAMBERT & CO., LTD., Thurmaston,

are well employed on the production of small, medium and large-capacity dust collecting units, which include standard Drytex, Dustmaster and wet Deduster types. Some of the firm's equipment is on view on the stand of the Birmingham Engineering Centre Group at the Brussels World Exhibition. H. B.

The Midlands

NICOR DESIGNS, LTD., Worcester Street, Wolverhampton, are busy with the design and planning of special-purpose units and complete transfer machines, several of which are destined for the aircraft industry. The premises, in which modern drawing office equipment is installed, are well appointed. At present more than 40 draughtsmen are employed on work which ranges from the design of a small component, to the detailing of the complete tooling for a new engineering product. When circumstances permit, arrangements can be made for special-purpose equipment, designed here, to be constructed in the shops of an associated company.

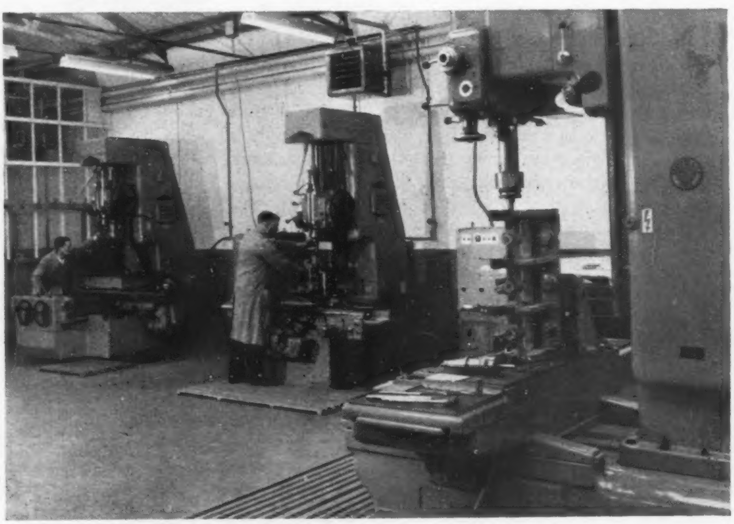
ROBERT HARRIS, LTD., Waddens Brook, Wednesfield, Staffordshire, are busy with the production of pressings for a range of exhaust silencers, fuel tanks and other accessories for internal combustion engine units. Several large presses are installed, including 150- and 200-ton machines by Wilkins & Mitchell, the former having been delivered recently. Delapena radio frequency induction heating equipment is employed for brazing fittings to small petrol tanks, the cycle time for this operation being 10 sec. Exhaust silencer pressings are assembled by seam welding. Other facilities at these works include a Parkerizing plant and a tool room.

VILLIERS (TOOL DEVELOPMENTS), LTD., Waddens Brook, Wednesfield, Staffordshire, a subsidiary of The Villiers Engineering Co., Ltd., Wolverhampton, have modern works with an area of 18,000 sq. ft., and it is planned to provide extensions, in the near future which will increase the space to 30,000 sq. ft.

This newly-established company is engaged in design and production of jigs, tools and special purpose machines for the parent firm, and to a greater extent for the engineering trade generally. Part of the works is laid out specially for the construction, and testing under working conditions, of transfer and other special purpose machines, and large fixtures. The machine shop is equipped with modern machine tools, most of which were new when they were installed. They include a 36-in. open-side and a 10- by 5- by 5-ft. planing machine; centre, turret and capstan lathes; machines for die sinking; and a range of grinding machines and boring equipment. The jig boring enclosure is large enough to house six machines, but so far only three have been provided—two by Newall and one by Kolb, as shown in the illustration. On the left is seen a Newall 2436 optical jig borer, stated to have been the first of its type to be supplied to a user.

The Kolb machine is shown with a fixture more than 30 in. high mounted on the table. There is a standards room, provided with modern inspection equipment, and a drawing office, with accommodation for ten draughtsmen, has recently been brought into operation.

F. W. H.



Part of The Jig Boring Enclosure at the Works of Villiers (Tool Developments), Ltd. Three Additional Jig Boring Machines are to be Installed in this Department

Nottingham

MYFORD ENGINEERING CO., LTD., Beeston, have a good volume of home and export orders in hand for their M.L.7 and Super 7 lathes, of 3½ in. centres, M.L.8 woodturning lathes, and M.G.12 cylindrical grinding machines. Recent innovations include a swivelling workhead for the cylindrical grinding machine, to which we hope to refer again, and a mortising attachment for the woodturning lathe. Lathes have recently been supplied for testing and truing brake drums. The latest addition to plant is Delapena honing equipment.

RAGLAN ENGINEERING CO. (1954), LTD., have lately noted some expansion in the home and export demand for the Little John 5-in. centre and capstan lathes. These machines have recently been exported to Nigeria, Ghana, Hong Kong, Sudan and the U.S.A., for example. H. B.

THE VALUE OF EXPORTS from this country of all types of machinery (other than electric) during the first six months of this year was £289,663,488. The corresponding figure for 1957 was £282,997,691, and for 1956, £260,207,707.

Developments in Tool Servicing Arrangements

(*Continued from page* 287)

Once it has been ensured that tools will be replaced regularly, it remains to provide for rapid interchange. Clearly, if delay is to be avoided, duplicate, sharpened tools must be available, and it is usual to make provision for the storage of such tools in conjunction with the tool-life indicating dials, where they are installed. It is equally necessary to employ tool holders which permit of presetting with the aid of simple fixtures and gauges. Actual replacement of tools on a machine is then a rapid and virtually unskilled operation. As an indication of the results than can be obtained in this manner, it is reported that nine tools employed in an experimental set-up on a multi-spindle automatic, for machining a sparking plug body, can be changed in 5 min. 40 sec. Without pre-set, quick-change holders, the time required was 42 min. 35 sec. This particular machine operates on a 4½ sec. cycle, and the time saved during one tool change represents an output of 492 parts.

The principle to be observed, clearly, is that the more expensive and productive the machine installation, the more important is correct tool selection and/or sharpening, and regular and rapid changing.

Machine Tool Exports and Imports

EXPORTS OF MACHINE TOOLS

Type of Machine	Month ended April 30, 1958	Four months ended April 30	
		1957	1958
	Value £	Value £	Value £
New, complete—			
Boring machines:			
Vertical	19,315	110,899	110,423
Other	75,248	299,458	274,457
Drilling machines	91,675	774,155	646,078
Grinding (excluding thread grinding), lapping and honing machines	200,585	855,329	742,578
Lathes:			
Automatic	97,169	663,048	505,893
Capstan	208,217	961,160	733,008
Other	248,393	1,039,617	967,998
Screwing machines	9,320	80,818	67,703
Threading machines	11,336	247,581	137,350
Milling machines (excluding thread-milling and gear cutting machines)	125,342	777,064	804,871
Planing, shaping and slotting machines	61,061	249,598	310,955
Presses:			
Hydraulic	26,670	417,249	214,261
Other	66,325	293,357	420,291
Punching and shearing machines	45,308	149,651	154,686
Other plate and sheet metal-working machines including straightening rolls	88,232	92,449	172,003
All other machines	206,833	1,054,953	936,863
Used machines, complete	77,095	231,877	243,076
Parts	172,806	756,460	759,654
Total	1,830,930	9,054,723	8,202,148
Destination			
Union of South Africa	144,145	469,693	644,478
India	208,343	1,240,677	1,227,090
Australia	279,481	1,317,164	1,222,882
New Zealand	28,321	138,370	147,484
Canada	150,965	566,070	631,843
Other Commonwealth countries	110,213	565,837	597,363
Soviet Union	20,528	426,785	63,746
Sweden	62,979	336,871	195,259
Western Germany	47,692	214,270	161,824
Netherlands	48,562	313,515	175,651
France	124,126	733,046	676,237
Spain	93,555	401,940	431,968
Italy	67,611	231,175	344,788
U.S. America	137,219	932,052	458,169
Other foreign countries	307,190	1,167,258	1,223,365

IMPORTS OF MACHINE TOOLS

New, complete—			
Boring machines	49,405	955,775	364,028
Drilling machines	20,150	105,583	91,291
Gear-cutting machines	102,397	426,629	196,912
Grinding, lapping and honing machines	186,175	867,229	863,195
Lathes:			
Automatic	243,859	730,854	1,015,725
Other	15,338	110,153	106,479
Milling machines	163,251	761,618	773,962
Planing, shaping and slotting machines	4,601	154,616	74,109
Presses	79,897	248,520	278,072
All other machines	470,295	1,454,768	1,461,421
Used machines, complete	144,816	84,204	236,410
Parts	282,019	1,558,399	1,175,713
Total	1,762,203	7,458,348	6,637,317
Country of Origin			
Western Germany	620,287	3,140,023	2,334,928
Switzerland	225,060	827,478	1,060,353
U.S. America	610,571	2,428,941	1,788,248
Other foreign countries	306,285	1,061,906	1,453,788

Letters to the Editor

[The Editor does not hold himself responsible for the views expressed by his correspondents.]

Practical Examples of the Applications of Ceroc Sintered Ceramic Cutting Tools

(*To the Editor of* MACHINERY)

SIR,—Having read the article under the above heading in MACHINERY, 93/20—2/7/58, I respectfully suggest that it could have carried a sub-title "Practical Examples of the Mis-application of Tungsten Carbide Cutting Tools."

It is the publication of this type of information, based on entirely false comparisons, which is tending to mislead industry concerning the relative merits of sintered oxide and sintered carbide tooling. In no case has the grade of carbide been mentioned or any details of tool geometry furnished. It is quite obvious to the experienced eye, from the data quoted, that incorrect grades of carbides were in use, particularly with reference to the vertical boring of workpiece *B* and the planing operation.

A comparison of the good utilization of oxide tips with poor utilization of carbide serves no purpose whatsoever, indeed it would be simple to write an article to produce the reverse picture based on similar "evidence." The purpose of this letter is not to deprecate the performance of the particular sintered oxide tool used, except to say that we would certainly expect to employ Wimet sintered carbides successfully at the speeds mentioned for that oxide material.

Furthermore, reference to steels merely by their tonnage is of little value when considering relative machinability of British, American and Continental steels. Such comparisons may only usefully be made from full analyses of the steels, the heat treatment conditions being known, and reference to photomicrographs of the structures.

Wickman, Ltd.,
R. N. COOK,
Research and Development Manager,
Coventry. Wimet Division.

Trade Publications

CHEMICAL PIPE & VESSEL CO., LTD., Godstone Road, Kenley, Surrey. Catalogue giving full dimensional particulars of the company's range of polythene tubes and fittings for plumbing. The advantages of this material for such purposes are described, and information is included on the procedure for welding polythene, also its chemical and physical properties.

ROTAX, LTD., Willesden Junction, London, N.W.10. Brochure describing typical applications of magnetic amplifiers to aircraft electrical systems, and indicating the extent of their use and the advantages which are claimed for this type of equipment. The publication includes photographs and theoretical diagrams, also a layout drawing for a typical aircraft generating system.

TAYLOR WOODROW (BUILDING EXPORTS), LTD., 41 Welbeck Street, London, W.1 (a member of the Arcon Group). Well-illustrated brochure showing some of the more recent applications of the Arcon sawtooth-roof building, both in this country and overseas. Advantages claimed include speed of erection; clean shape, both internally and externally; maximum utilization of natural light; and the fact that it may readily be extended.

FRY'S METAL FOUNDRIES, LTD., Tandem Works, Merton Abbey, London, S.W.19. Booklet with loose pages, in a stiff card cover, entitled "The Flowsolder Method of Soldering Printed Circuits." A feature of the Flowsolder machine (see MACHINERY, 89/1469—28/12/56) is that heated solder is continuously circulated through an 8-in. wide nozzle in the bath so that it is delivered in a wave form. Printed circuits up to 7½ in. wide, and of virtually any length, are moved in a straight path in contact with the crest of the solder wave. The booklet comprises different sections which give details of and working instructions for the Flowsolder machine, particulars of Flowsolder alloys, and information concerning the actual soldering process.

Coventry Gauge Rockwell Merger

The directors of Coventry Gauge & Tool Co., Ltd., and of Rockwell Engineers, Ltd., announce that they have reached agreement, in principle, as to a merger of the two concerns. It is envisaged that this will be achieved by the acquisition by Coventry Gauge & Tool Co., Ltd., of the whole share capital of Rockwell Engineers, Ltd. Accordingly, and subject to agreement in detail and to C.I.C. consent, it is the intention of Coventry Gauge & Tool Co., Ltd., soon to make a formal offer to acquire the whole share capital of Rockwell Engineers, Ltd., in consideration of the issue of 5 Coventry Gauge & Tool Co., Ltd., ordinary stock units of 10s. each for each 4 Rockwell Engineers, Ltd., ordinary shares of 5s. each.

Mr. C. E. Rockwell and Mr. John Middleton would, on completion, join the board of Coventry Gauge & Tool Co., Ltd.

The Rockwell Machine Tool Co., Ltd., would continue to operate under the same name.

Correction

In the advertisement for Panton & Webb, Lavender Hill, Tonbridge, Kent, which appeared on p. 103 of MACHINERY for July 30, the description accompanying the first illustration should have read: "The latest addition to a range of all-British fine-pole permanent magnetic chucks. The working area is 14 in. by 12 in." The correct designation of the second item is: "The Fimax 73 S.B. universal magnetic chuck."

Industrial Notes

INCORPORATED PLANT ENGINEERS announce that their head office is now at 2 Grosvenor Gardens, London, S.W.1 (telephone number, Sloane 0469).

THE PALNUT CO., LTD., inform us that they are now occupying their new works and offices. The address is Palnut Works, 3 Arthur Street, Hove, 3 (telephone number, Hove 70427).

BABCOCK & WILCOX, LTD., 209 Euston Road, London, N.W.1, inform us that their collaboration with the American company of the same name is to be extended to include technical co-operation in the field of nuclear power.

AN AUCTION SALE OF MACHINE TOOLS and miscellaneous stores from Technical Stores Depot, Old Dalby, Melton Mowbray, will be held on September 3. The auctioneers will be Shouler & Son (Dept. N), 1 Norman Street, Melton Mowbray.

PERMALI, LTD., Bristol Road, Gloucester, have recently installed a polytetrafluorethylene sintering oven with internal dimensions of 6 by 6 by 15 ft. long. This oven enables the dispersion coating process to be applied to such large items as tanks, rollers, and containers, for example, and is also being used for sintering solid P.T.F.E.

THE ALUMINIUM DEVELOPMENT ASSOCIATION, 33 Grosvenor Street, London, W.1, have issued the 1958 editions of the following publications: Directory of Members; List of Publications; and List of Films, Film Strips, and Wall Charts. These publications are available, on request, from the above address.

THE BRITISH IRON AND STEEL FEDERATION, Steel House Tothill Street, London, S.W.1, has issued a booklet entitled "The Steel Industry's Labour Record." Sections are included under the sub-headings: comparison with other industries; negotiating machinery; and unions in the industry.

APPLEBY-FRODINGHAM STEEL COMPANY, a branch of the United Steel Companies, Ltd., inform us that the new steel plate rolling mill at their Scunthorpe works is now in operation. This 12-ft., 4-high mill is powered by twin 4,000-h.p. D.C. motors, and the minimum thickness of plate that can be rolled is ¼ in. For plates ½ in. thick, the maximum width is 11 ft. 6 in.

THE 1959 NUCLEAR CONGRESS will be held at Cleveland, Ohio, U.S.A., from April 5 to 9, and more than 150 papers will be presented on such subjects as reactor design, disposal of radioactive wastes, radiation shielding, and instrumentation. Particulars can be obtained from the Engineers Joint Council, 29 West 39th Street, New York 18, New York.

ADA (HALIFAX), LTD., Pellon Lane, Halifax, producers of washing machines and spin driers, have recently acquired Mile Cross Sheds, Halifax, with a floor space of 30,000 sq. ft., which were formerly occupied by Courtaulds, Ltd. It is proposed to develop a fully-automatic factory which, eventually, will be capable of producing 2,000 refrigerators per week. This project, estimated to cost £150,000, will include the provision of a fully automatic stove-enamelling plant, electro-static paint spraying equipment, and other new machinery.

THE BIRMINGHAM COLLEGE OF TECHNOLOGY has organized a series of one-day conferences on electronic digital computers and their industrial applications. The first of these conferences, which will have special reference to Ferranti computers, is to be held on October 8, and full details of the complete series can be obtained from the Registrar, College of Technology, Gosta Green, Birmingham, 4.

STEEL CENTENARY.—A ceremony was held recently to commemorate the 100th anniversary of the first mass production of ingot steel in the world, on the original site of the old blast furnace at Edsken in Sweden. This furnace was erected by G. F. Göransson in 1857 for experiments with the production of steel according to the Henry Bessemer process. In July, 1858, Göransson finally succeeded in producing steel by this method.

MOTOR CAR PRODUCTION.—British motor-car production in the first six months of the year reached a new high level at 550,699, compared with 388,572 in the same period of last year. Motor car exports also reached a new peak at 250,883, during the first half of the year, compared with 204,946 in the corresponding period last year. In the first quarter, car exports totalled 132,323, and in the second quarter, 118,560.

AIRMEC, LTD., High Wycombe, Bucks., recently entered into an agency agreement with Apparacchi Scientifici Federici, of Milan, whereby they hold the exclusive rights to market in the United Kingdom ultrasonic drilling and ultrasonic medical equipment made by the latter organization. The ultrasonic drilling equipment permits of cutting intricate forms in ceramics, hard metals and other materials.

J. BROUGHTON & SON (ENGINEERS), LTD., 234 Pershore Road South, Birmingham, 30, inform us that the manufacture and marketing of their range of mechanical guards for presses, milling machines, die casting machines, and similar equipment, has been transferred to a subsidiary company, Plant Inspection & Control, Ltd. These products will still be known as Broughton guards and the manufacture and marketing of all other equipment will be continued by the parent company.

THE WICKMAN FILM UNIT has recently made the first of a quarterly magazine series entitled Facts and Faces. In black and white, with sound, it is concerned with various new Wickman products and developments, and runs for 14 min. Other Wickman films include Wimet at Work, Designing and Applying Carbide Tools, The Wickman Erodomatic and Impact Extrusion. All, including the first, Facts and Faces, are available on loan from the Publicity Department, Wickman, Ltd., P.O. Box 44, Coventry.

G. & J. WEIR, LTD., Cathcart, Glasgow, S.4, and CATTON & CO., LTD., 29 Chadwick Street, Black Bull Street, Leeds, 10, are to combine their foundry activities,

and for this purpose a new company known as Weir-Catton, Ltd., is being formed. This company will acquire the capital of Catton & Co., Ltd., also that of the Argus Foundry, Ltd., which is at present a wholly-owned subsidiary of G. & J. Weir, Ltd. Under the new arrangement, the name of Argus Foundry, Ltd., will be changed to Weir Foundries, Ltd.

Borough Polytechnic, Borough Road, London, S.E.1, are holding an evening course in work study, which will start on September 22. This course is intended primarily for students who have already qualified for parts I and II of the Production Engineers Examination, and who desire to prepare for the work study examination in part III under the existing regulations for 1958-9. A syllabus may be obtained on application to the Department of Mechanical Engineering, at the above address.

S. Parsons & Co., Ltd., St. George's Ironworks, Young, Street, Bradford, have developed special equipment for weighing and checking the centre of gravity of, the new Armstrong-Whitworth AW 650 Freightercoach aircraft. There are separate weighbridges for the two main wheels, and a nose wheel weigher, which is mounted on a mobile lift constructed by Shorts Lifts, Ltd., Bradford. It is stated that preliminary tests have indicated that the equipment will operate with a total error of 4 lb. for loads up to 60,000 lb.

Plannair, Ltd., Epsom Road, Leatherhead, Surrey, are building a new factory at Leatherhead which will add 15,000 sq. ft. of floor area to their existing capacity. This new factory, which is scheduled for completion in October, will incorporate research laboratories equipped with high and low temperature cabinets capable of simulating all climatic conditions. Plans are also in hand for a further extension, of 4,000 sq. ft., which will provide additional factory space and administrative offices. When these buildings are completed and in full production, it is stated, the company's output will be trebled.

Roballo Engineering Co., Ltd., 43 Dover Street, London, W.1, a newly-formed English company, have been granted exclusive marketing rights in Great Britain for Roballo ball bearing slewing rings and it is stated that arrangements have been made for their production in this country. The slewing rings, to which reference has previously been made in Machinery, 91/1435—20/12/57, are intended for application to slewing cranes, excavators, derricks, revolving fire ladders, turntables and similar equipment. In addition, the company will supply large-diameter wire-race ball bearings for continuously rotating machinery.

The American Society for Testing Materials has published volume 57 of the Proceedings, covering the year 1957. This publication, which extends to 1,430 pp., covers the technical activities of the Society during that year, and includes reports and papers presented during the year and accepted for publication, also discussions. A summary of the proceedings of the A.S.T.M. 60th annual meeting, and the Philadelphia Spring Meeting is given, together with a programme for each session, indexed by title and author. Copies of the publication can be obtained from the A.S.T.M., 1916 Race Street, Philadelphia 5, Pa., U.S.A., price $12.

Winston Electronics, Ltd., Shepperton Middlesex, announce that they have organized extensive installation and maintenance facilities for the range of electronic equipment which they are marketing for Beckman Berkeley and Berkeley Helipot, Calif., U.S.A. The range includes electronic and magnetic counting, reading, and timing instruments, time interval meters, frequency measuring apparatus, digital recorders, pulse generators, scintillation counters, oscillators, and Helipot precision potentiometers. The latter are available in 16 basic designs, and are now being produced by Beckman Instruments, Ltd., the new British subsidiary of Beckman Instruments, Inc., U.S.A. at their factory at Glenrothes, Fife, Scotland.

City and Guilds of London Institute, Gresham College, Basinghall Street, London, E.C.2, announce a new course on engineering drawing which will start in the next session. The course includes applied mathematics, mathematics and geometry, and materials and processes, and is intended for students who have attained the S.3 level in the National Certificate (Mechanical) course, or hold an intermediate certificate in machine shop engineering, or the appropriate final certificate. Provision is also made for older students who have already gained drawing office experience. Enquiries concerning this new course should be marked "B.5," and sent to the Director of the Institute at the above address.

Alfa-Laval Anniversary

A well-presented and illustrated brochure has been issued in connection with the 75th anniversary of the formation of the Alfa-Laval/De Laval Group of Companies. The parent firm—the Separator Company, Stockholm—was formed in 1883 to exploit Dr. Gustav De Laval's invention of the first continually operating cream separator.

Products of the Group now include cream separators and other farm and factory dairy equipment, centrifugal separators for oil and other liquids, heat exchangers, stainless steel pumps, textile machinery, car body pressings, washing machines, and agricultural machinery.

The British organization (Alfa-Laval Co., Ltd.), with factories at Brentford, Middlesex, and Cwmbran, Monmouthshire, has a substantial production of milking machines, centrifugal separators, filters, pumps and heat exchangers.

Cold-pressure Welding

In MACHINERY, 93/207—23/7/58, was published an article entitled some applications of cold-pressure welding. We are asked to point out that the process there described was developed by the General Electric Research Laboratories, East Lane, North Wembley, Middlesex (see MACHINERY 73/832—16/12/48), to whom all enquiries concerning applications in this country should be addressed.

Personal

MR. R. J. BARRITT has been appointed chief executive, Engineering Division, The British Oxygen Co., Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1. He will take up his duties on September 1.

MR. FRED COOPER has retired, at the age of 71, after 59 years' continuous service with Geo. Salter & Co., Ltd., West Bromwich, Staffs. His brother, Mr. Frank Cooper, who is aged 73, is still employed with the company, which he joined 60 years ago.

MR. J. BETTS, who was formerly with Taylor, Taylor & Hobson, Ltd., has joined the staff of Gamet Products, Ltd., Hythe, Colchester, as technical sales engineer. He will cover the Midland area and starting in September will operate from, 54 Hidcote Road, Oadby, Nr. Leicester.

MR. J. N. HEMSLEY is retiring after representing Deloro Stellite, Ltd., Highlands Road, Shirley, Birmingham, in London and Southern England, for more than 20 years. As a sales engineer and specialist in Stellite hard-facing and cutting tools, he is widely know in the area.

MR. EDWARD E. TOON has been appointed managing director of Stern & Bell, Ltd., Stour Street, Birmingham, with whom he has held the position of works director since 1950. He recently succeeded Sir Graham Cunningham as managing director of Weldall & Assembly, Ltd., Stourbridge, Worcs., and is also chairman of Charles S. W. Grigg, Ltd., Hounslow, all the companies mentioned being members of the Triplex Engineering Group.

MR. SIDNEY ALLEN, M.I.Mech.E., F.R.Ae.S., has been appointed chief engineer for all products of Armstrong Siddeley Motors, Ltd., Parkside, Coventry, except motor cars. He was formerly chief engineer (rockets).

In addition to their aero engines, motor cars and rocket engines, the company are now building air-cooled diesel engines, auxiliary gas turbines and air starters, and will build the large Maybach diesel engines under licence.

Scrap Metals

†LONDON.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—clean copper wire, untinned and free from lead and solder, £160; clean heavy copper, untinned and free from lead and solder, £154; second grade copper wire, £147; clean light copper, £142; braziery copper, £126; gunmetal, £129; brass mixed, £92; lead, net, £56; zinc, £29; cast aluminium, £84; old rolled aluminium £107; battery lead, £29; unsweated brass radiators, £78; hollow pewter, £495; black pewter, £365.

MIDLANDS.—Trading, which has been carried on at reduced tempo over the past few months, has practically come to a standstill with the advent of the annual industrial two weeks' holiday. Steelworks and foundries are not accepting deliveries and blast furnaces are taking limited tonnages only.

Yards are fully stocked with all grades of scrap, a large proportion of which consists of processed material for which no markets are open. Discussions in connection with the export of scrap are reported, and merchants will hope that the position may thus be eased in the difficult weeks ahead.

Prices are still falling, due to the fact that many tons of production scrap will have to be stored indefinitely until such time as consumers can accept deliveries without restriction. Even heavy scrap is difficult to place and local steelworks will not be giving out allocations until the end of August.

Light scrap is still being " tipped " in many areas as there is little demand for either No. 5 material or hydraulically compressed destructor bundles.

Although the Control Order covering maximum selling prices is still in forme the prices of many grades are now far below the maximum and merchants have reduced their offers accordingly.

Light scrap is not wanted, apart from limited quantities of light steel cuttings for pressing, and bushy turnings are practically unsaleable.

No improvement is expected until towards the end of the year.

Current maximum control prices, delivered consumers' works, are now: *Heavy steel No. 1, 217s. 6d.; *heavy steel No. 2, 196s.; *heavy steel No. 4, 207s. 6d.; *heavy steel No. 5, 195s. 6d.; light iron No. 8, 149s.; short turnings No. 9 (free from alloy), 167s. 3d.; light steel No. 11, 164s. 3d.; bushy turnings, 117s.; short alloy turnings, 160s. 9d.; short steel No. 2, 233s. 3d.; machinery cast, 233s.

Prices may be increased up to 2s. 6d. per ton according to quantities tendered over a given period.

* For use by Round Oak Steelworks, Brierley Hill, increase by 1s. 6d. per ton.
† George Cohen, Sons & Co., Ltd., 600 Commercial Road, E.14.
‡ Subject to market fluctuations.

International Institute of Welding

The tenth Annual Assembly of the International Institute of Welding, recently held in Vienna, was attended by some 800 delegates from 27 countries, including Great Britain, and France. It may be noted that the U.S.S.R., Yugoslavia, and the Argentine were represented for the first time. As a result of the meeting, some 30 documents are to be issued for publication, among which the following may be noted: results of an international investigation on residual stresses and stress relieving; effect of localized heat treatment on the fatigue behaviour of welded joints; particular instances of cracking caused by fatigue; training and qualification of engineers, technicians, and welders; welding problems in parts of the Atomium of the Brussels Exhibition; aad recommendations for the classification of steels for welded constructions.

The work of the International Institute of Welding is carried on by 15 technical commissions and includes the publication of literature such as the quarterly, *Bibliographical Bulletin for Welding and Allied Processes*, a multilingual collection of terms for welding and allied processes, and a collection of reference radiographs of welds.

The affairs of the Institute are administered in this country by the Institute of Welding, 54 Princes Gate, Exhibition Road, London, S.W.7.

Machine Tool Share Market

The general undertone of stock markets was firm during the period under review, but mainly quiet conditions prevailed in most sections, with buying interest selective, and price changes were generally small and irregular.

The gilt-edged section sustained a moderate turnover, but after it had remained steady to firm for the most part, an easier tendency developed, and quotations of British Funds, also home corporation and Dominion stocks, finished with slight declines on balance.

In the principal sections of the industrial share market a satisfactory undertone was maintained. Although activity never reached a high level, and movements among prices generally were moderate, the trend, for the most part, was towards higher levels, and a few good features developed.

Among machine tool issues, Birmingham Small Arms advanced 3d. to 27s. 9d.; British Oxygen, 1s. 3d. to 37s. 9d.; Broom & Wade, 4½d. to 11s. 3d.; Chas. Churchill, 1½d. to 4s. 10½d.; Geo. Cohen, 6d. to 11s. 3d.; and John Shaw & Sons (Wolverhampton), 1½d. to 11s. 7½d. On the other hand, Coventry Machine Tool lost 6d. at 8s. 3d.; and John Harper, 3d. at 12s. 6d.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	9d.
Armstrong, Stevens & Son, Ltd.	Ord.	5/-	8/3
Allen (Edgar) & Co., Ltd.	Ord.	£1	30/6
" "	5% Prf.	£1	14/9*
Arnott & Harrison, Ltd.	Ord.	4/-	13/6
Asquith Machine Tools Corp., Ltd.	Ord.	5/-	18/9
" " "	6% Cum. Prf.	£1	18/6
Birmingham Small Arms Co., Ltd.	Ord.	£1	27/9
" "	5% Cum. "A" Prf.	£1	15/6
" " "	6% Cum "B" Prf.	£1	17/6
" " "	4% 1st Mort. Deb.	Stk.	86/-
British Oxygen Co., Ltd.	Ord.	£1	37/9
" " "	6½% Cum. Prf.	£1	21/3
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	4/9
Broom & Wade, Ltd.	Ord.	5/-	11/3
" "	6% Cum. Prf.	£1	17/9
Brown (David) Corporation Ltd.	5½% Cum. Prf.	£1	14/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/9
Butler Machine Tool Co., Ltd.	Ord.	5/-	6/3
" " "	5% Cum. Prf.	£1	13/9
C.V.A. Jigs, Moulds & Tools, Ltd.	5½% Red. Cum. Prf.	£1	13/9
Churchill (Charles) & Co., Ltd.	Ord.	2/-	4/10½
" " "	6% Cum. Prf.	£1	26/3
Churchill Machine Tool Co., Ltd.	Ord.	5/-	17/7½
" " "	6% Cum. Prf.	£1	18/6
Clarkson (Engrs.), Ltd.	Ord.	5/-	12/6
Cohen (George), Son & Co., Ltd.	Ord.	5/-	11/3
" " " "	4½% Cum. Prf.	£1	14/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	14/3
" " " "	5% Cum. Red. Prf.	£1	16/3
Coventry Machine Tool Works, Ltd.	Ord.	4/-	8/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	6/7½
Elliott (B.) & Co., Ltd.	Ord.	1/-	2/9
" "	4½% Red. Cum. Prf.	£1	13/9
Export Tool & Case Hardening Co., Ltd.	Ord.	2/-	1/3
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	12/-
Greenwood & Batley, Ltd.	Ord.	£1	48/1½

COMPANY		Denom.	Middle Price
Harper (John) & Co., Ltd.	Ord.	5/-	12/6xd
"	4½% Red. Cum Prf.	£1	13/1½
Herbert (Alfred), Ltd.	Ord.	£1	35/-
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	10/6
" " "	"B" Ord.	5/-	10/3
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	21/3
" " "	7% Cum. Prf.	5/-	5/-
Kayser, Ellison & Co., Ltd.	Ord.	£1	46/-
" " "	6% Cum. Prf.	£1	18/3
Kendall & Gent, Ltd.	Ord.	5/-	7/7½
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	6/3
Kitchen & Wade, Ltd.	Ord.	4/-	11/6
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/4½
Massey, B. & S., Ltd.	Ord.	5/-	8/3
Modern Engineering Machine Tools Ltd.	Ord.	5/-	10/7½
Newall Engineering Co., Ltd.	Ord.	2/-	4/6
Newman Industries, Ltd.	Ord.	2/-	2/3
" " "	6% Prf. Ord.	5/-	5/6xd
Noble & Lund, Ltd.	Ord.	2/-	2/9
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	18/-
" " "	5½% Cum. Prf.	£1	26/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	21/3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	5/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	36/9
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	11/7½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	11/3 ex rights
" " " "	5% Cum. Prf.	£1	15/-
Stedall & Co., Ltd.	Ord.	5/-	6/3
Tap & Die Corporation, Ltd.	Ord.	5/-	7/6
" " "	4½% Deb. 1961-1977	Stk.	82/-
Wadkin, Ltd.	Ord.	10/-	17/6
Ward (Thos. W.), Ltd.	Ord.	£1	79/0½
" "	5% Cum. 1st Prf.	£1	15/9
" "	5% Cum. 2nd Prf.	£1	24/-
Willson Lathes, Ltd.	Ord.	1/-	2/4½

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. † Birmingham price.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig-Iron

Foundry and Forge No. 3, Class 2

Middlesbrough zone	£21 6 0
Birmingham	£20 18 3

Phos. 0·1 to 0·75%

Birmingham	£23 17 0

Scottish Foundry

Grangemouth	£25 3 6

Hæmatite

English No. 1

N.E. and N.W. Coast	£25 6 6
Scotland	£25 13 0
Sheffield	£26 15 0
Birmingham	£27 4 0

Welsh	£25 6 6

Steel Products

Medium plates	£45 11 6
Mild steel plates, ordinary*	£42 2 0
Boiler plates*	£44 12 0
†Flat bars 5 in. wide and under } †Round bars under 3 in. }	£40 0 6
Billets, rolling quality, soft U.T.	£32 15 6

Phosphor Bronze

Ingots (2B8) (A.I.D.) d/d	£258 0 0

Copper

Cash (mean)	£207 7 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£271 15 0
Rods 5/16 in. to ¾ in. diam.	£291 15 0
Tubes, 1¼ in. bore by 10 SWG, ton lots, per lb.	2s. 9⅜d.
Wire rod, black, hot-rolled (¼-5/16 in.) English	£222 17 6

Zinc

Refined, minimum 98 per cent. purity, current month (mean)	£64 15 0

Brass

Tubes, solid drawn, per lb.	1s. 7½d.
Strip 63/37, 6 in. by 10 SWG coils, ton lots	£228 0 0—£230 10 0
Rods, ¼-3 in. diam. (59 per cent copper)	1s. 9⅞d.

Yellow Metal

Condenser plates, per ton	£165 0 0
Rods, per lb.	1s. 10⅞d.

Aluminium

Ingots min. 99·5 per cent Canadian d/d	£180 0 0

Lead

Refined, minimum 99·97 per cent purity, current month (mean)	£71 7 6

Tinplates

‡U.K. Home trade:	
Handmill f.o.t. makers' works	£3 11 8¼
Cold reduced, f.o.t. makers' works	£3 7 4¼
U.K. Export:	
Hot rolled basis, f.o.t. works' port	72s. 6d.—75s. 0d.
Cold reduced basis, f.o.t. works' port	75s. 0d.

Gunmetal

Ingots, 85.5.5.5. ex works	£168 0 0

* N.E. Coast, N. Joint Area, Central Scottish Zone.

† U.T. soft basic.

‡ Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f, ex works 2 ton basis	£42 17 0
Free cutting black	£47 6 6

Reeled Steel Bars[1]

Single-reeled 1¼ in. upwards, f.o.t. works (+ usual extra for sizes)	£43 9 6
Free cutting	£47 19 0

High-Speed Steel

Black random length bar. All prices basic, per lb., subject to extras.

Molybdenum "66"	5s. 10½d.
Molybdenum "46"	5s 8½d.
14 per cent tungsten	5s. 9d.
16 per cent tungsten	6s. 1½d.
18 per cent tungsten	6s. 4d.
22 per cent tungsten	7s. 5d.
5 per cent cobalt	9s. 6d.
4·75/5·25 per cent molybdenum + 6·0/6·75 per cent tungsten + 1·75/2·05 per cent vanadium (5-6-2)	6s. 0½d.

Precision-ground, High-speed Free-turning Brass Rod[2]

⅜-in. dia. ± 0·00025-in. 2-ton lots, per lb.	2s. 4⅞d.

Grey Iron Rod

Die Cast[3] in random lengths 18 in. to 26 in. rough machined 1/16-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
¾ or ⅞ in.	245s. 4d.	318s. 10d.
1 or 1⅛ in.	196s. 4d.	251s. 10d.
1¼ to 1½ in.	137s. 10d.	171s. 2d.
1⅝ to 2 in.	106s. 2d.	125s. 11d.
2¼ to 3½ in.	91s. 6d.	106s. 4d.
3⅝ to 12 in	86s. 6d.	99s. 2d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. dia. + 0·010 to 0·020 in., prices as quoted for die cast bar[3]

6-ft. lengths	¾ or ⅞ in.	245s. 4d.
centreless ground	1 or 1⅛ in.	196s. 4d.
+ 0·010 in. Extra		
for hardenable	1¼ to 1½ in.	137s. 10d.
alloy iron[4]	1⅝ to 2 in.	106s. 2d.
Per cwt. net	2¼ to 3½ in.	91s. 6d.

Stellite[5]

Welding Rods plain

¼ in. dia. per lb.	30s. 0d.

Toolbits

½ in. sq. × 4 in., each	22s 3d.

Precision-ground Mild Steel[2]

1-in. dia. + 0·00025-in. 4-ton lots, per cwt.	121s. 6d.

1 Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. 2 Pratt, Levick & Co., Ltd., Chester. 3 Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. 4 "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. 5 Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

BASIC PRICES FROM LONDON STOCK[6]

Free Cutting Steel

Bright cold drawn:	
(Usaspead) over 1½ to 2 in.	£59 17 6
Lead bearing (Usaled)	£64 4 0
Precision ground, 1¾ in.	£81 12 6

Bright Drawn

M.S. bars (M.M.C.) over 1½ in. to 2 in.	£55 3 6
Square edge flats (Usaflat)	£72 0 0
M.S. angles (Usaspead)	£99 10 0
Casehardening (EN) (Usacase) over 1½ in. to 2 in.	£63 9 6
M.S. bars (EN3B) (Usamild) over 1½ to 2 in.	£57 3 6
Carbon manganese semi-freecutting case hardening (EN202) (Usaspead 202) over 1½ to 2 in.	£72 19 0
35/45 ton tensile (EN6) (Usen) over 1 to 1½ in.	£64 17 6
0·4 Carbon Normalised (Usaspead "40") over 1½ in. to 2 in.	£66 19 6
Carbon manganese steel to Specification EN.16.T (Usaspead 5565), per ton	£127 11 3

Ground Flat Stock

18-, 24-, and 36-in. lengths (Usaspead). List prices less 5 per cent

Oil Hardening Cast Steel

Non-shrink (Usaspead N.S.O.H.) ⅜ in. to 2¾ in., per lb.	1s. 11d.
Non-distorting heavy duty (Usaspead H.C.H.C.) ⅜-in. to 2¾-in., per lb.	4s. 2d.

Silver Steel

(0·194-in. to 1½-in.) Genuine Stubs quality, per lb.	4s. 6d. less 27½%
M.M.C. quality, per lb.	2s. 5d. + 6¼%
Boxes of 16 assorted sizes 1/16-in. to ⅜-in. dia.	7s. 6d.

Stainless Steel

K.E. 40.AM (Freecutting), per lb.	3s. 3½d.

Glacier Machined Bronze Bars

Phosphor bronze (2B8) } Lead bronze }	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application.

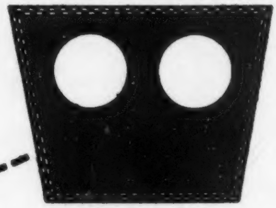
Toolholder bits: Usaspead "Super" " "Supreme" " Cobalt 10 }	List price

Shimstock

Steel assorted, per tin	3s. 6d
Brass " "	7s. 3d.

6 Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.

the GROMMET story



4 good reasons for fitting BTR High Test V-BELTS

1

HIGHER HORSEPOWER

Grommet construction makes the most efficient use of high tensile cords to produce the strongest V-belts yet made. For grommet construction ensures that *all* the cords of a belt share the load *equally*—which is the condition for maximum transmitting efficiency. Furthermore, a grommet, being an endless loop of high tensile cords, has no joints to weaken the belt, no overlapping sections to stiffen it.

2

MORE GRIPPING POWER

Grommet construction ensures that the belt exerts full driving grip on the walls of the pulley groove, for there are no central cords to dip and 'dish' the belt, pulling it away from the walls under load. This extra driving grip allows heavier loads and prevents belt slip.

3

MORE OUTPUT FOR ELECTRICITY CONSUMED

Despite its superior strength, a grommet is the most flexible V-belt load carrying device yet developed. Thus the belt runs cool and absorbs minimum energy in flexing around the pulleys. This saving in power appears in extra pay-load for electricity consumed.

4

LONGER BELT LIFE

Operating with a higher safety factor than ordinary V-belts, BTR grommet V-belts last longer because they are stronger and also because being so flexible they are subject to little strain in flexing round the pulleys.

BTR

ENGINEERS IN RUBBER

BTR HIGH TEST GROMMET V-BELTS

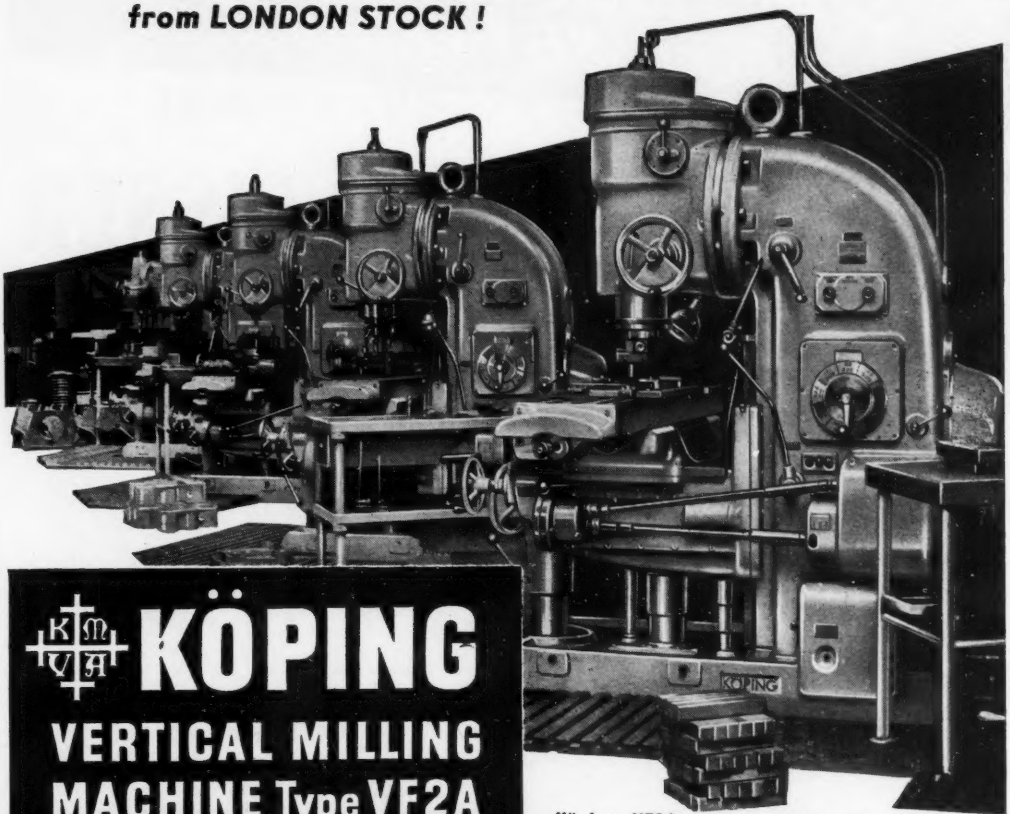
Patented in Great Britain by BTR Patent No. 567406

BTR Industries Ltd HERGA HOUSE, VINCENT SQUARE, LONDON S.W.1 *TEL: VIC 3848*

D1359

★ IMMEDIATE DELIVERY

from LONDON STOCK !



KÖPING

VERTICAL MILLING MACHINE Type VF2A

Köping VF2A *Vertical Milling Machines—Table size 59 × 14—in operation at the Metal Box Co. Ltd. on general precision engineering and high production work.*

In addition to power feed in all three directions of table, they have power feed to spindle and adjustable stops. Also rapid power feeds on all movements. Swivelling head, autocycle movement in longitudinal traverse of table. Adjustable drop worm, disengagement of power feed to spindle which is furnished with an efficient brake for rapid stopping. A large range of optional extra equipment for accurate adjustment of table and accurate depth milling for jig boring purposes. Power circular milling with indexing attachment, etc. Robust construction, unsurpassed Quality and Workmanship.

DISTRIBUTORS AND STOCKISTS FOR THE UNITED KINGDOM

MORTIMER ENGINEERING COMPANY

PROPRIETORS: S. GUITERMAN & CO. Ltd

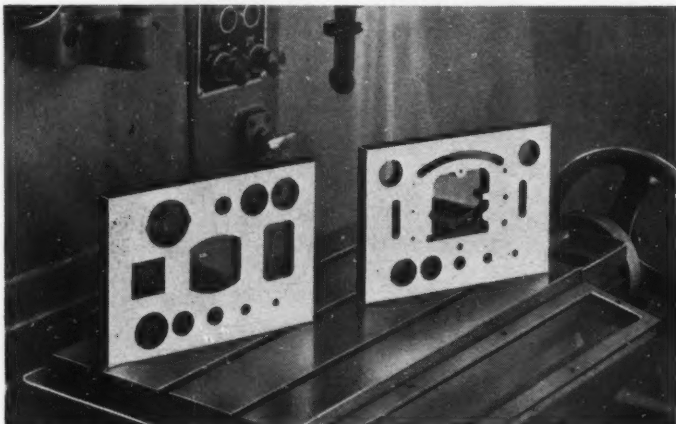
Showroom & Sales: **204/206 ACTON LANE · HARLESDEN · N.W10 · Tel: ELGAR 3834**

the *Ultimate* in Jig Grinding . . .

MOORE-CATMUR

NO. 2 PRECISION JIG GRINDER

Samples showing the possibilities of this machine



View with dust protective aprons removed

Designed for the accurate location and grinding of

HOLES

Straight or tapered

CONTOURS

regular and irregular, straight or tapered

Especially suitable for the production of accurate press tools; Table size 10" x 19"

We also manufacture

THE MOORE-CATMUR JIG BORER

CATMUR MACHINE TOOL CORPORATION LIMITED

103 Lancaster Road, Ladbroke Grove, London, W.11. 'Phone PARk 9451/2

NRP 1449

come to

LAPOINTE

for better

broaching

Vertical Internal Broaching Machine broaching Crown Wheels (bore 7¼"/9" diameter) fully automatic loading and unloading.

Capacity: 5/50 tons.
Broach lengths: 42/68 inches.
Can be supplied for 1, 2, 3, or 4 stations.

British Made

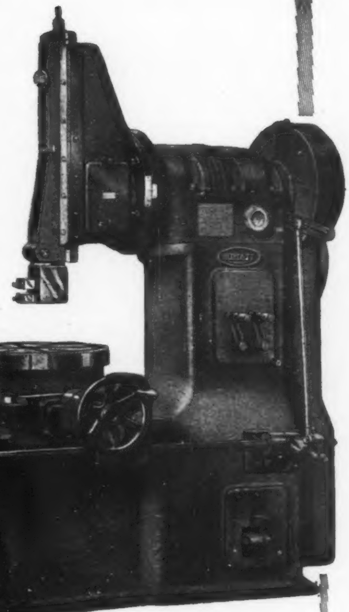
The Lapointe Machine Tool Co Ltd
Otterspool Watford-by-Pass Watford Herts
Telephone Gadebrook 3711 (4 lines) Cables Lapointe Watford
Also The Lapointe Machine Tool Company Hudson Mass. USA

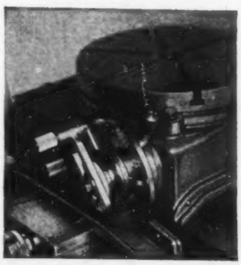

GHA
For two-and three dimensional reproduction
PRESENT DELIVERY
DIESINKING
MACHINES—
EX STOCK
GEORGE H. ALEXANDER MACHINERY LTD.
82-84 COLESHILL STREET · BIRMINGHAM · 4
PHONE: ASTON CROSS 3264 (7 LINES) GRAMS: 'VIKING,' BIRMINGHAM

GENERAL DUTY OR TOOLROOM

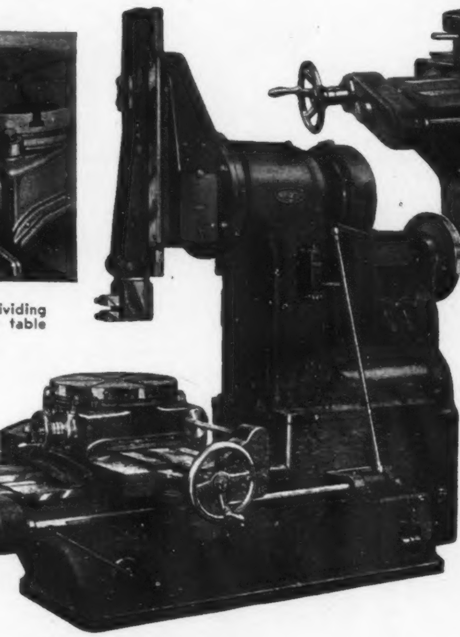
UNIVERSAL VERTICAL SHAPING & SLOTTING MACHINES

The BURDETT range for the toolroom includes high speed, versatile and accurate machines with 8", 10", 12" and 14" strokes. Tooling is uncomplicated and operation, simple. The BURDETT design features strength and rigidity, together with ample bearing surfaces, to withstand deflection under heavy loads, and preserve accuracy under the most arduous conditions of operation. The system of construction is such that all working parts are easily accessible for inspection and maintenance. The swivelling head can be inclined 10° either side of the vertical and the rotary table, which indexes 12 positions, has safety interlock of hand and power feeds. A dividing attachment can be fitted in a matter of a few minutes. The 10" model in this range is illustrated below.





Close-up showing dividing attachment on rotary table



GENERAL PURPOSE MACHINES

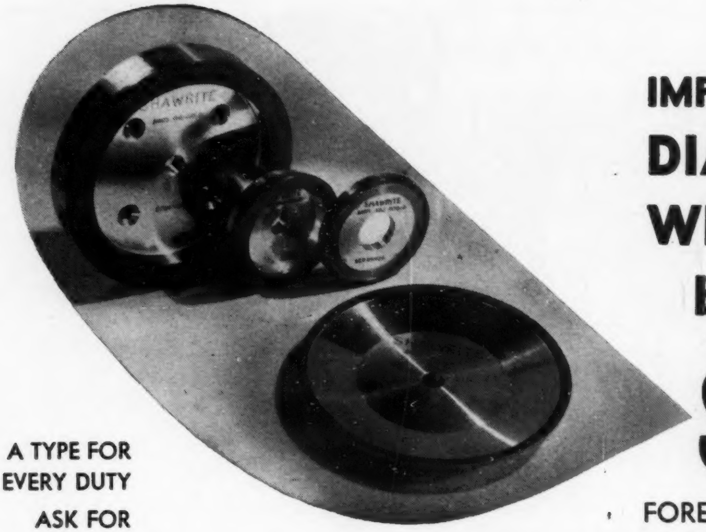
The machine above is available in two sizes, with $6\frac{1}{2}$" and $8\frac{1}{2}$" strokes. It possesses many features of the toolroom model described above but is intended primarily to accommodate the many jobs which do not require such extreme accuracy and versatility.

Full details of both types are available on application.

it's **BURDETT** FOR SLOTTERS!

Write for brochures:—

G. W. S. BURDETT & CO LTD · EASTGATE · PETERBOROUGH



IMPREGNATED DIAMOND WHEELS by SHAW

FOREMOST IN QUALITY — SUPREME IN PERFORMANCE

A TYPE FOR EVERY DUTY

ASK FOR DETAILS

A. SHAW & SON (DIAMONDS) LTD

WATERLOO RD., NORTH CIRCULAR RD., LONDON N.W.2

PHONE: GLADSTONE 1171-2 GRAMS: SCINDERE, NORPHONE LON.

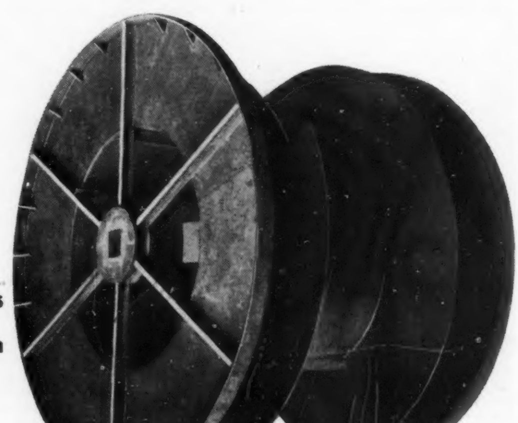
IT'S CERTAINLY A FABRICATION

Machine Tool Frames, Bases and Cabinets

Welded Fabrications of Any Description

From 5 lbs. to 5 tons in Weight

Excellent Facilities for Machining



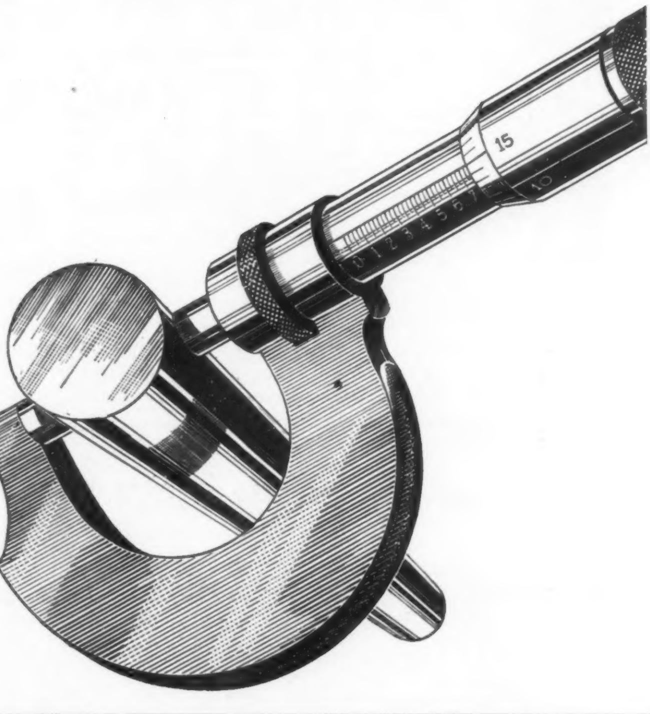
We recently fabricated this 8 feet dia. reel to carry 15 tons of steel cable.

AND A GOOD ONE BY REDGRAVE DEAN

REDGRAVE DEAN & CO. LTD., STATION ROAD, COLESHILL. Tel. Coleshill 3001-2

PARK GATE

QUALITY STEELS FOR BRIGHT DRAWING



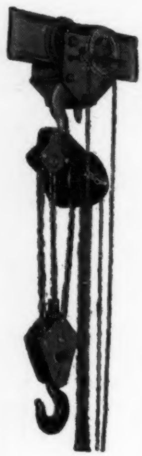
black bars

rolled

to close limits

THE PARK GATE IRON & STEEL COMPANY LIMITED ROTHERHAM
A (TI) Company TELEPHONE: ROTHERHAM 2141 (10 lines) TELEGRAMS: YORKSHIRE, PARKGATE, YORKS

let VAUGHAN pulley blocks take care of the UPS and DOWNS of materials handling

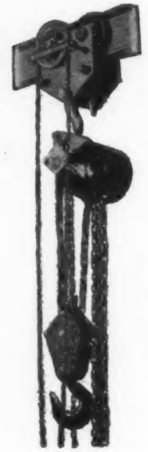


TYPE A.47

Sizes $\frac{1}{2}$, 1, 2, 3, 5 Tons

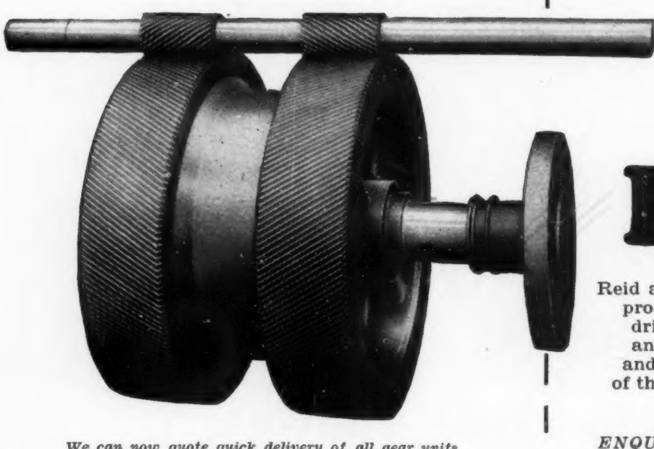
SPECIFICATION

FRAME.—All-steel of great rigidity.
GEARS.—Machine-cut with balanced tooth pressures, and high efficiency.
BEARINGS.—Hardened and ground.
CHAIN SPROCKET.—Cut from solid 0·4% carbon steel.
CHAIN.—High tensile chain with large factor of safety.
HOOK.—Made from special quality mild steel, fitted with ball-bearing swivel.
COVERS.—Pressed steel enclosing block and chain wheel.
CHAIN WHEEL.—Pressed steel, shrouded.
BRAKE.—Automatic in action, offers no resistance when hoisting comes into operation immediately hand chain is released, totally enclosed.
TEST.—Each block tested with 50% overload and certificate supplied.
TROLLEYS.—These blocks are all made to suit the standard range of VAUGHAN Trolleys.



THE VAUGHAN CRANE CO. LTD.
MANCHESTER 12 : : ENGLAND
TELEPHONE EASt 2771

HIGH SPEED GEARS UP TO 3000 h.p.



We can now quote quick delivery of all gear units.
Write, or 'phone Johnstone 861 for full details.

Reid *Every Type - Every Size - for Every Need*

THE REID GEAR CO. LTD., LINWOOD, NR. PAISLEY

Reid

Reid are completely equipped to produce all types of gears and drives. Gears up to 3,000 h.p. and spiral bevels of 34in. dia. and over give some indication of the resources at the *Linwood* factory of *Reid*.

ENQUIRIES ARE WELCOMED FOR ALL TYPES OF GEAR CUTTING AND SPECIAL MACHINE GEAR DRIVE MACHINING.

M&W

ENGINEERS' PRECISION TOOLS

No. 902 ADJUSTABLE INSIDE MICROMETER cap 2" - 8", is supplied complete with micrometer body, extension rod, distance piece, and extension handle in a velvet-lined instrument case.

No. 941X ADJUSTABLE MICROMETER, cap 0"-4" supplied complete with setting rods, adjustable anvils and adjusting keys in fitted wooden box.

No. 961 MICROMETER cap 0" - 1" is pearl chrome plated for easy reading and manufactured to British Standard Institution Specification. Supplied with setting key in new spring-hinged box.

No. 1021 SET OF MICROMETERS, containing 1 each Micrometers Nos. 961, cap 0" - 1", 966/2" cap 1" - 2", and 966/3" cap 2" - 3"

MEASURE UP TO ANY JOB

The next time you buy tools, remember that it pays to buy good tools, tools upon whose accuracy you can rely.

The next time you buy tools, specify M&W tools—YOU CAN RELY ON THEM.

SEND 10½d. IN STAMPS FOR A COPY OF OUR LATEST CATALOGUE, MENTIONING THIS JOURNAL.

MOORE & WRIGHT (Sheffield) LTD., 14/28 NORTON LANE, SHEFFIELD, 8.

HUNT'S

Machines we Manufacture . . . . . .

TWIST DRILL SHARPENING MACHINES

Six sizes $\frac{1}{16}$ in. - 4in.

TAP SHARPENING MACHINES

Three sizes $\frac{1}{16}$ in. x 6in.

SURFACE GRINDING MACHINES

18in. x $6\frac{1}{2}$in. x 12in.

TOOL & CUTTER SHARPENING MACHINES

10in. x 20in.

TWIST DRILL MANUFACTURING

For : Flute Milling, Clearance Milling, Clearance Grinding

TAP & REAMER MANUFACTURING MACHINES

For : Flute Milling, Relief Grinding, Flute Grinding

PEARNS TAPPING ATTACHMENTS AND ACCESSORIES

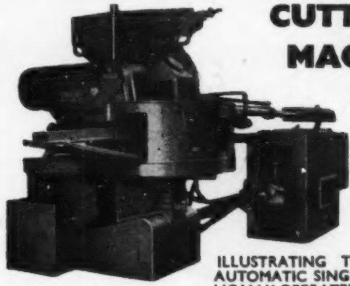
Write for full particulars :

HERBERT HUNT & SONS LTD.
ELSINORE RD., OLD TRAFFORD, MANCHESTER, 16
Phone: 0663-0664 Trafford Pk. 'Grams: Hunting Manchester

INSTANT, EASY CUTTING-OFF WITH **Ballinger**

WET-TYPE ABRASIVE WHEEL

CUTTING-OFF MACHINES



ILLUSTRATING TYPE 'A' FULLY AUTOMATIC SINGLE BAR HYDRAULICALLY OPERATED MODEL. CAPACITY 3 in. SOLID BAR WITH 16 in. WHEEL.

This wet-type machine can be supplied with fully automatic single or triple bar stock feeds. Long wheel life. Clean, cool, fast cutting. Fitted with Eccentric Wheelhead for cutting difficult alloys. Full range of models available. *Ask for details.*

L. J. H. BALLINGER LTD.
WOODCHESTER, STROUD, GLOUCESTERSHIRE
Phone : AMBERLEY 2186/7

---

indexing

AUTOMATIC MULTI-SPINDLE

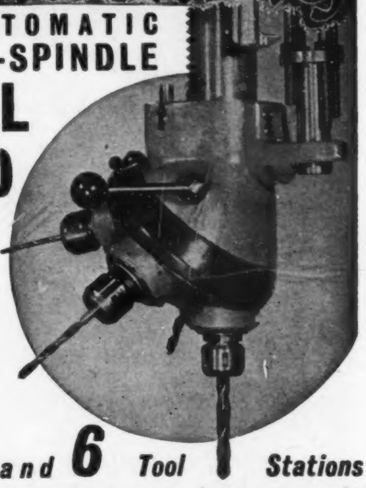
DRILL HEAD

SIZES

5"/16

1"/2

5"/8



4, 5 and 6 Tool Stations

Collets, Chucks, Tapping Head, Turret Depth Stop, Pre-selector Variable Speed Drive

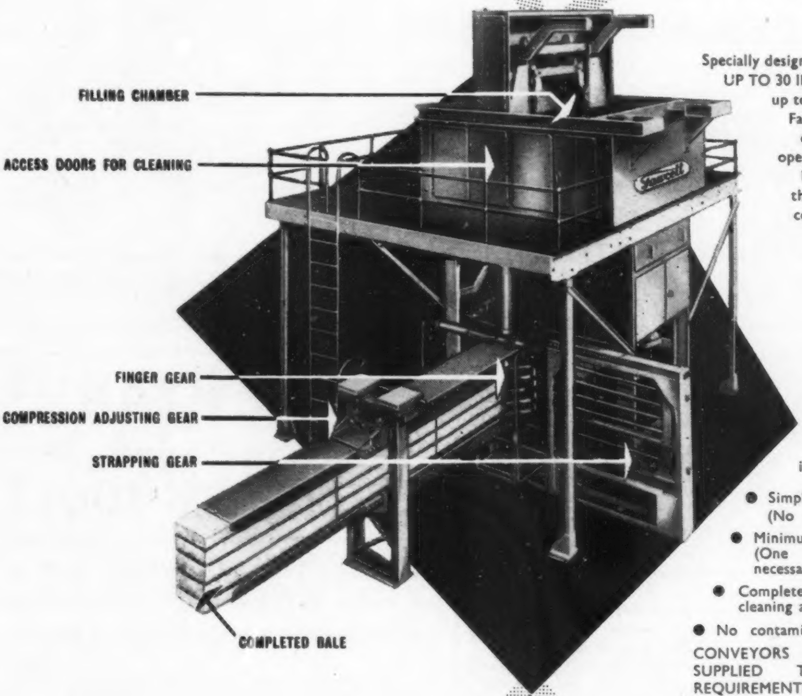
EMBASSY MACHINE & TOOL COMPANY LTD.
248, Watford Way, Hendon, Londan, N.W.4.
Phone: SUNnyhill 2029

THE *Fawcett*

HORIZONTAL SYNTHETIC

FIBRE BALING PRESS

FOR AUTOMATIC OPERATION



Specially designed to handle BALES UP TO 30 lbs/cu. ft. density and up to 400 lbs. weight, the Fawcett Baling Press is entirely automatic in operation with the fibre being delivered from the spinning lines by a conveyor and weigher direct to the trampling box. Full safety measures are incorporated throughout the full cycle of operation whether automatic or hand controlled. Outstanding advantages of the Fawcett Press include:—

- Simple installation. (No pits required)
- Minimum labour costs. (One operator only is necessary)
- Complete accessibility for cleaning and maintenance.
- No contamination of material.

CONVEYORS AND WEIGHERS SUPPLIED TO CUSTOMERS' REQUIREMENTS

PRESS FRAME AND BOX OF ALL-STEEL 'COLCLAD' CONSTRUCTION
HYDRAULICALLY OPERATED MAIN RAM WITH ADJUSTABLE STROKE & PRESSURE REGULATION
HOPPER DOOR OF MILD STEEL 'COLCLAD' PLATE PNEUMATICALLY OPERATED & FITTED WITH HOOD
AUTOMATIC POSITIVE LOCKING OF TRAMPLER PLATEN IN BALING POSITION
AUTOMATIC SELF-STRAPPING OF BALE
INDIVIDUAL CONTROL OF EACH OPERATION

FAWCETT PRESTON & COMPANY LIMITED

(Incorporating Finney Presses)

BROMBOROUGH CHESHIRE *Telephone: Rock Ferry 2201 Telegrams: 'Fawcett, Bromborough'*

Branch Offices in London, Birmingham & Glasgow.

A MEMBER OF THE METAL M INDUSTRIES GROUP OF COMPANIES.

FF/155

use 'Celastoid' for

transparent machine guards

Undoubtedly the finest material for machine guards, 'Celastoid' acetate sheet allows a clear view and gives protection to the operator.
We can give immediate delivery of this famous British Celanese product, yet it costs you no more than if you went direct to the manufacturers. If needed, we can fabricate or mould your 'Celastoid' for you. For samples, sizes and prices, send the coupon today.

LOOK AT THESE ADVANTAGES

- Shatterproof
- Flame resistant
- Washable
- Easily cut and machined
- Inexpensively heat-formed into curves

To:—
G. H. BLOORE LTD., 66 The Broadway, Mill Hill, N.W.7
or 46 Weaman Street, Birmingham, 4

Please send me 'Celastoid' samples and details of sheet sizes and prices.

NAME ....

ADDRESS ....

TIB. 22 ....

G. H. BLOORE

offer immediate delivery of

'Celastoid'

acetate sheet

MOORE

SLEEVES & SOCKETS

FOR EVERY DUTY

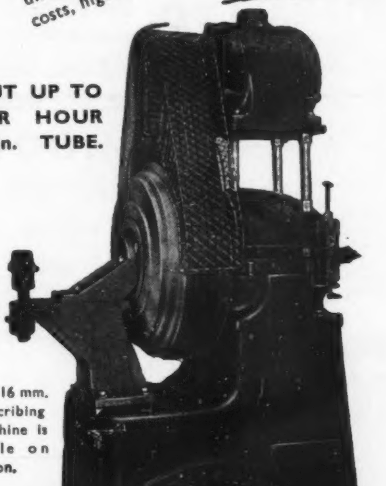
Specialised production methods ensure the highest quality and accuracy. Internal and external tapers are guaranteed to standard Morse Gauges.
OIL TOUGHENED SLEEVE ground on outside taper and reamer finished on the inside, ensuring an accurate high-class product at a moderate price.
HARDENED AND GROUND SLEEVES case hardened throughout and ground on inside and outside. Do not bruise or burr and therefore protect the machine spindles.
EXTENSION SOCKETS supplied in the above two qualities.
BLANK END SOCKETS supplied soft with turning plug.
CAPSTAN SOCKETS supplied in the hardened and ground quality only
FULL RANGE OF TYPES AND SIZES AVAILABLE IMMEDIATELY FROM STOCK

THE MOORE MANUFACTURING CO. LTD.
PROGRESS WORKS - LAISTERDYKE - BRADFORD 4 - YORKS
'PHONE: BRADFORD 64365-6 'GRAMS: MOORANCO, BRADFORD

INTRODUCING The S&B ROTARY COLD TAGGING MACHINE

Backed by 30 years' experience in building rotary swagers, the makers have designed this new machine especially for cold tagging steel and non-ferrous tube or bar. Four dies are mounted in a fixed head and do not rotate. THERE IS NO POSSIBILITY OF THE DIES REVOLVING THE TUBE risking injury to the operator. Advantages are a uniform strong tag, no heating and furnace costs, higher production.

OUTPUT UP TO 200 PER HOUR ON 2in. TUBE.

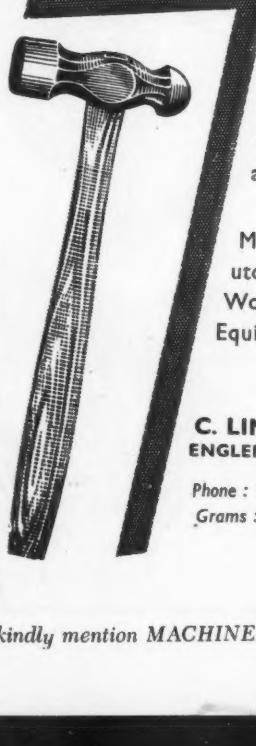


A short 16 mm. film describing this machine is available on application.

STEVENS AND BULLIVANT Ltd

WESTERN ROAD BIRMINGHAM 13 ENGLAND

Whatever the TOOL LINDLEY'S have it



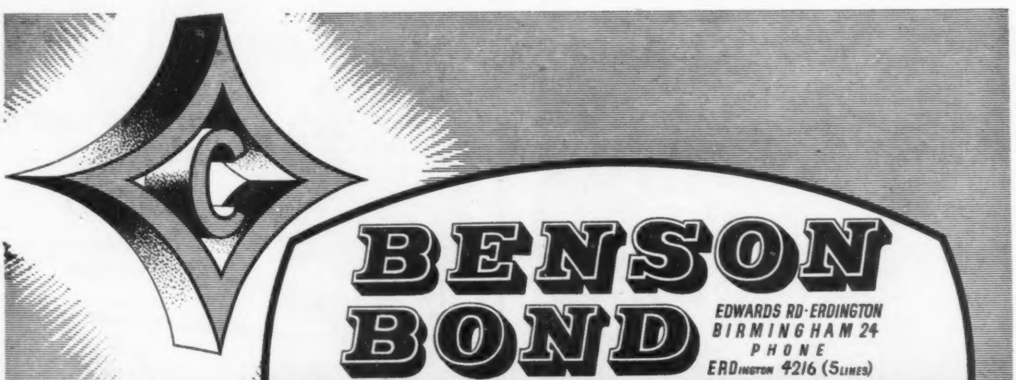
Comprehensive stocks of machines, tools and accessories.

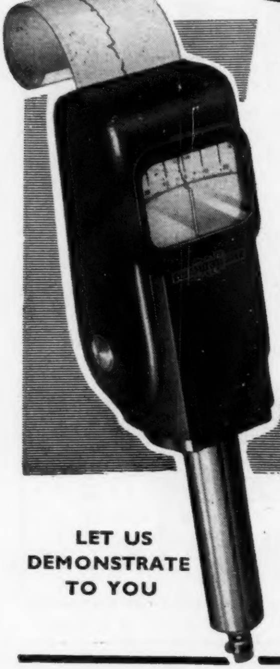
Main stockist and distributors for Black & Decker, Wolf, and Bridges Electrical Equipment.

C. LINDLEY & CO. LTD.
ENGLEFIELD RD., LONDON, N.1.

Phone : CLIssold 0643 (5 lines)
Grams : BEAUVOIR NORDO, LONDON


Thos. Wm. Lench Ltd.
PHONE: BLACKHEATH 1151
BLACKHEATH
BIRMINGHAM
ENGLAND.
GRAMS: LENCHONIA, BLACKHEATH, BIRMINGHAM
SPECIFY
REGISTERED TRADE MARK
ADMIRAL
BRAND
SPECIFY
REGISTERED TRADE MARK
ADMIRAL
BRAND
MAKERS OF
Bolts, Screws, Rivets.


BENSON
BOND
EDWARDS RD · ERDINGTON
BIRMINGHAM 24
PHONE
ERDINGTON 4216 (5 LINES)
FOR
CLEVELAND
MO-MAX
MO-MAX COBALT
CLE FORGE



SCHOPPE & FAESER

GRAPHOTEST

The recording precision indicator

The GRAPHOTEST measures and records at the same time. It can be used in place of ordinary indicators for all purposes, and provides an immediate pen record of its readings.

AVAILABLE with 100, 200, 250 or 400 times magnification.

RECORDING SENSITIVITY — at 100 times magnification — less than 0.0000 in.; at 400 times magnification — 0.000025 in.

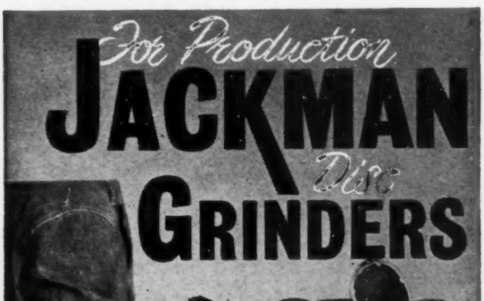
TWENTY FIVE PAPER SPEEDS by simple substitution of worm gears.

LET US DEMONSTRATE TO YOU

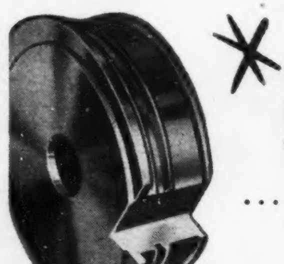
SOLE AGENTS:
VAUGHAN ASSOCIATES LIMITED

4 QUEEN STREET, CURZON STREET, LONDON, W.1
Telephone: GROSVENOR 8362-5
Midland Office. WILFORD CRESCENT NOTTINGHAM
Telephone: NOTTINGHAM 88008

NRP.



GEO. JACKMAN MACHINE TOOL CO. LTD.
73 EASTBOURNIA AVENUE, LONDON, N.9.

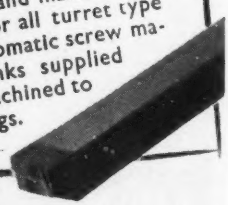


PROFILE GROUND FORM TOOLS

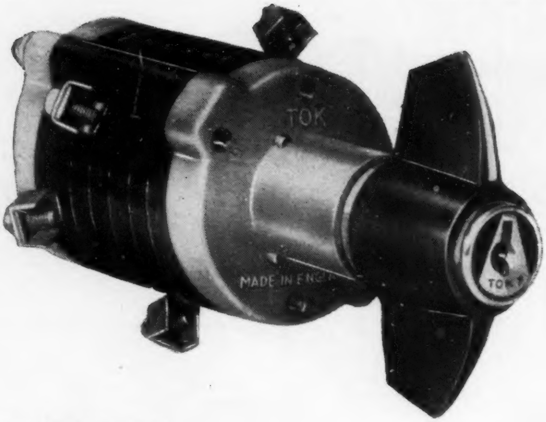
. . . in High Speed Steel and Carbide Tipped

for Automatics...

We design and manufacture complete tooling for all turret type and swiss-type automatic screw machines. Cam blanks supplied ex-stock. Cams machined to customers drawings.



MOSER CAMS & TOOLS LTD.
465, HORNSEY ROAD, LONDON, N.19
Telephone: ARCHWAY 1766 & 7017



NEW

TOK SWITCHES

The famous Knoblock switch—thousands of which are already in service—is now available in an even more robust and elegant form. The lockable handle is not an adaptor but an integral part of the switch—for maximum reliability and easy mounting.

KNOBLOCK

The dependable, lockable switch for machine tools, control gear, instrument panels, etc., and all applications involving safety of equipment and personnel.

FOR DELIVERY *NOW*

TOK ELECTRICAL AND INDUSTRIAL MECHANISMS LTD · 17 BURY STREET · LONDON E.C.3
Telephone: Avenue 5035

COXETER

Revolving Centres

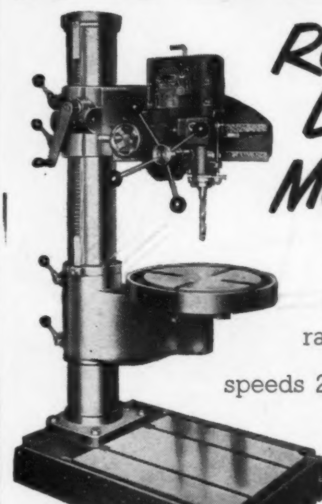
- **Models for Bar or Tubular work**
- **Standard sizes, morse taper and parallel shanks**
- **Best Cast Steel construction hardened and ground**
- **Heavy duty bearings**
- **Especially suitable for heavy cutting with tipped tools**
- **Special sizes quoted for**
- **Quick deliveries**

IMPROVED TYPES
Price list on application

REVOLVING CENTRES LTD.
40-41 PARK END STREET, OXFORD
Phone: OXFORD 2275/6 *Grams:* COXETERS, OXFORD

ARBOGA

Radial Drilling Machine

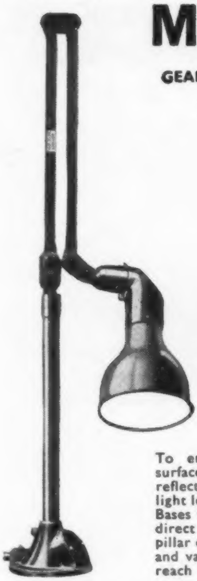


ER. 125 S.
1" capacity
radial arm 27"
speeds 200—3500 r.p.m.
price.
£284 · 0 · 0

MORTIMER ENGINEERING COMPANY
PROPRIETORS S. GUITERMAN & CO. Ltd

Sales Office: 204-6 Acton Lane, Harlesden, N.W.10. ELGar 3834

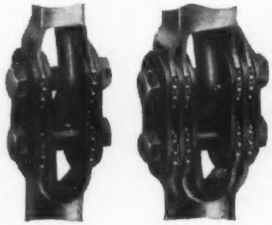
When answering advertisements kindly mention MACHINERY.



MEKELITE

GEARED JOINT

INDUSTRIAL LIGHTING UNITS

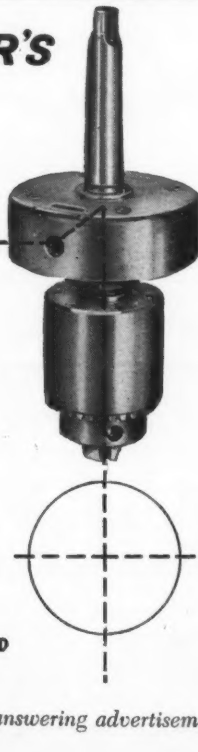


To ensure satisfactory service extra friction surfaces are provided as required by the size of reflector used and its distance from the base. For light loads a single pair of links is sufficient.
Bases for wall, bench, ceiling, floor or mounting direct on machines; also portable types. With pillar or short vertical pivot. Six sizes of reflector and various lengths of arm (maximum horizontal reach 54in.).

Catalogue sent free on request.

MEK-ELEK Engineering Ltd.
17, Western Road, Mitcham, Surrey
Telephone: MITcham 3072 Cables: Mekelek, London

TOOLMAKER'S DRILL CHUCK



FOR GREATER ACCURACY
in less time

MSE

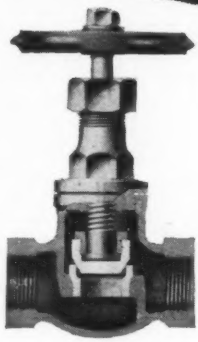
MACHINE SHOP EQUIPMENT LIMITED
Spenser Street, London, S.W.1.
Telephone: VICtoria 6086

HOPKINSONS'

BRONZE VALVES

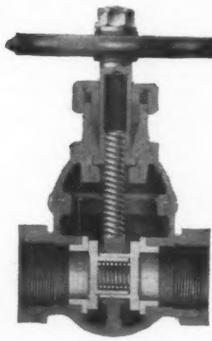
sizes up to 2" bore

IMMEDIATE DELIVERY FROM STOCK



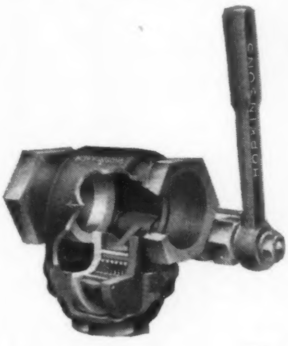
"S. T. S." VALVES

Sturdy general-purpose valves for isolating or regulating purposes.
Screwed or flanged connections available.



PARALLEL-SLIDE VALVES

Reliable general-purpose valves for duties where the flow is in either direction. Screwed or flanged connections available.



LINK VALVES

Robust quick-opening valves on parallel-slide principle. Easy to operate, suitable for many duties including process steam control, compressed air, thick heavy liquids, etc. With screwed connections.

All the above valves are for pressures up to 250 lb/sq. in. (steam) or 350 lb/sq. in. (cold water, air, oil, etc.)

HOPKINSONS LIMITED · HUDDERSFIELD
London Office: 34 NORFOLK STREET STRAND · W.C.2.

H.V. 113

PRESSING PROBLEMS ARE SOLVED BY

The universal drawing device for any size and make of press

WORSON DIE CUSHIONS LTD.
RABONE LANE WORKS · SMETHWICK · STAFFS.

STEER CLEAR OF DERMATITIS!

Dermatitis, production's greatest enemy, can soon put skilled hands out of action. Rozalex is the proved safeguard against this risk. For over 25 years Rozalex have specialised in barrier creams for industry. They have provided the answer to most industrial skin irritants. Their full technical resources and experience are at *your* disposal on request to: Rozalex Ltd., 10 Norfolk Street, Manchester 2.

ROZALEX BARRIER CREAMS

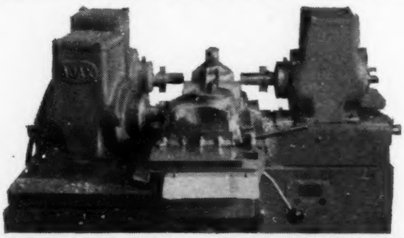
R.101

Surface & Localised Flame Hardening by the "Shorter Process"

We treat Gearing of All Types, Cams, Levers, Shafts, Drum Rolls, Dogs, Clutches, Machine Beds, Slides, Spindles, etc. In all Carbon and Alloy Steels, Plain and Alloy Cast Iron, Meehanite and Malleable Steels.

THE JAY EFF FLAME HARDENING CO., LTD.
LITTLE HOLME STREET, LEICESTER
PHONE: LEICESTER 21998

TREBLE YOUR MACHINE OUTPUT!



AJAX AJ5/6 MOTORISED UTILITY HEAD

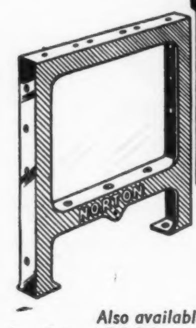
GIVES FAST FLOOR TO FLOOR MACHINE TIMES

Illustration shows three AJAX AJ5 Utility motorised Heads which each simultaneously bore a 2-in. hole and surface a boss on light alloy casting in 160 seconds.
Motor driven by rotor and stator unit $\frac{1}{2}$ h.p. at 1,425 r.p.m. or $\frac{3}{4}$ h.p. at 2,800 r.p.m. as required. 3in. diameter three-jaw self-centring chuck is standard. Lever operated collet mechanism for work up to $1\frac{1}{2}$in. diameter available.

AJAX

AJAX MACHINE TOOL CO. LTD.
WESTMOUNT WORKS, HALIFAX, YORKS.
PROP: ADA (HALIFAX) LTD.

NORTON



***STANDARD* CAST IRON BENCH LEGS**

TOP AND BOTTOM RAILS, SIDES AND FEET CORED FOR BOLTING

Also available in sizes 'C & D' with 9in. by 1in. drop of top rail to accommodate thicker timber.

SIZE 'A'	SIZE 'B'
24in. wide	30in. wide
30in. high	30in. high
$2\frac{1}{4}$in. wide Top Rail	$2\frac{1}{4}$in. wide Top Rail
$\frac{3}{8}$in. Bolt Holes	$\frac{3}{8}$in. Bolt Holes

Delivery from stock *Special sizes to order:-*

T. NORTON & CO. LTD., CARVER ST., BIRMINGHAM, 1

Telephones: CENtral 4325 (5 lines) · Telegrams: Notronco, Birmingham

CLASSIFIED ADVERTISEMENTS

RATES : PLAIN ADVERTISEMENTS Except " Situations Wanted " (ALL TYPE) : 2/2 per line. MINIMUM 8/8 (4 lines) OR £1 8s. 2d. per inch (13 lines per inch). *Box Nos. 1/3 extra per insertion.* SITUATIONS WANTED : 1/8 per line. MINIMUM 6/8 *plus* 1/3 *Box No.* SPECIAL DISPLAY TYPE (with or without Blocks): 1/32 p. £1 10s.; 1/16 p. £3; 1/8 p. £6 or £2 per inch (min. 3/4 in.) *Series rates on request.*

CONTRACT WORK

••• DESIGNS •••

PRECISION PRODUCTS (ROMFORD) LTD.

TOOL DESIGNERS AND MANUFACTURERS

For all your needs

IN

JIGS · FIXTURES
GAUGES · PRESS TOOLS
FORM TOOLS AND
SPECIAL MACHINES

Viking Works, London Rd., Romford, Essex. Tel : Romford 61991/2

Immediate Capacity Available for Design of Jigs and Tools.—BETTAJIG DRAWING OFFICE, 7a, Crendon Street, High Wycombe, Bucks. Phone: High Wycombe 4091.

DESIGNING & MANUFACTURING TO THE TOOL MAKING TRADE INCLUDING JIG BORING & PROTOTYPE WORK TO AIR MINISTRY STANDARDS A.I.D. & A.R.B. APPROVED

Williams & Iliffe Ltd Tel: 88944
IRON BRIDGE WORKS, BEDWORTH ROAD, LONGFORD, COVENTRY

NAISH BROS. & CO. LTD.,
124, CHELTENHAM ROAD, BRISTOL - Tel.: 25532-3.

PRESS TOOLS
FIXTURES
SPECIAL MACHINES
PRESSINGS
GEARS

In all Directions
DESIGNEX (COVENTRY) Ltd
can help
Phone 64049

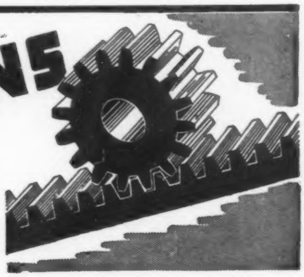
PRESS TOOLS
LAMINATIONS—COMBINATION—PROGRESSION, ETC.
JIGS—FIXTURES
PROTOTYPE MACHINING
Designing—Short Order Work—Sub Assemblies Completely Tooled
JIG BORING AND PRECISION GRINDING
LANDEN (ENGINEERS) LTD.
1a, Aubert Park Highbury, London, N.5
Phone: CANonbury 1075

EST^D 1889
R. STEPHENS & SON LTD
PRESS TOOLS · JIGS
FIXTURES · MOULDS
GAUGES · DESIGNS
115 CHURCH ROAD
UPPER NORWOOD
LONDON S.E.19
PHONE LIVINGSTONE 2265-6

Press Tools, Press Work, Jigs, Fixtures, Capstan and Auto. Turning. Special H.S. Cutters. Components manufactured and assembled to specif.—L. PERSON & SON, 63, Shaftesbury Street, N.1. CLE. 7139.

••• GEARS •••

RACKS & PINIONS



CUT FROM 4 D.P. TO 50 D.P.
EAGLE MILLING Co. Ltd.
114-116, Lancefield Street, LONDON, W.10
Telephone LADbroke 0725 and 1294

● *ENGINEERING BUYERS NEED MACHINERY'S ANNUAL BUYERS' GUIDE*

When answering advertisements kindly mention MACHINERY.

Classified Advertisements (*CONTRACT WORK, contd.*)

GENERAL ENG'G. •• SERVICES ••

Immediate Capacity Available, castings, non-ferrous, die, shell moulded, sand, etc. Also machining and stove-enamelling.—MILLS ENGINEERING PRODUCTS, LTD., Barnet. 'Phone: Barnet 6741.

Centre Lathe Turning Up to 7½in. centres by 48in. b.c. Tool, Prototype and small batch work. Modern plant. A.I.D. approved.—WARD ELECTRIC CO. (NORWOOD), LTD., 44, Chapel Road, W. Norwood, S.E.27. GIPsy Hill 1620.

REPAIRS By WELDING

BROKEN MACHINE TOOL PARTS
& DAMAGED PLANT IN ALLOY STEELS,
CAST IRON & NON-FERROUS METALS
SPEEDILY REPAIRED BY WELDING

ESTABLISHED OVER 40 YEARS

THE BLAKER MOTOR & WELDING Co. LTD.

Welding Engineers

DUKES RD., PARK ROYAL, LONDON, W.3.
Phone ACORN 4811. Grams: Blakerweld, Ealux London

WEBLEY & SCOTT can make it for you . . . *and make it right*

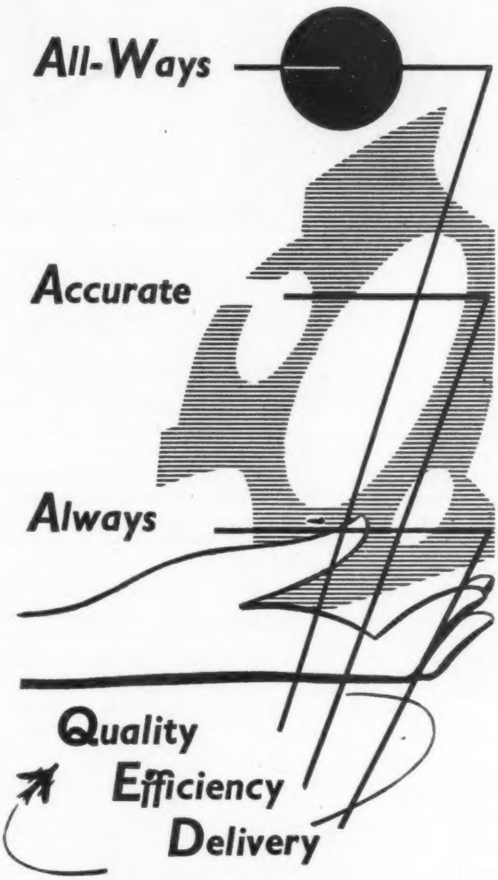
Plant includes—
Capstans, Automatics, Milling, Drilling, Profiling, Grinding, Deep hole drilling, Broaching, Heat Treatment, Brazing, Metal Colouring, Spraying, Phosphate Treatment, Assembly

MAY WE QUOTE FOR YOUR REQUIREMENTS

WEBLEY & SCOTT LTD.
WEAMAN ST., BIRMINGHAM, 4
EST. 1790

CAPACITY AVAILABLE *for*
CLOCKWORK MECHANISMS
INSTRUMENTS ASSEMBLIES
PRODUCTION of SMALL GEARS
and TURNED PARTS

ROBERT PRINGLE & SONS
36-42 Clerkenwell Road, London, E.C.1
Telephone: CLErkenwell 2341



DESIGN & MAKE

Our Research and Design facilities for the production of close tolerance Test Rigs, Gauges, Models, Components and Assemblies to timed schedules are at YOUR service—and, of course, Precision Toolmaking and Special Purpose Machines. Serving Industry, M.O.S., Admiralty and U.K. Atomic Energy Authority.

Our Technical Department is available for consultation at all times.

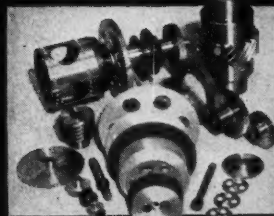
PREMIER PRECISION LTD

Research & Development Engineers & Toolmakers

WESTERN ROAD, BRACKNELL, BERKS.

Classified Advertisements (*CONTRACT WORK, contd.*)

CINETRA (A.I.D. approved) for FINE PRECISION ENGINEERING



Telephone: GULliver 2353 / 4085

GENERATED GEARS 10 to 100 DP, to finest tolerances

12, OVAL ROAD, LONDON, N.W.1.

A.I.D. —— THE —— CUN 5195

HEAT TREATMENT

PEOPLE OF LONDON

G.R.M. SERVICES LIMITED, PADDINGTON, W.9.

GAUGES (*Not Thread*) —JIGS—FIXTURES, etc.

EXPERIMENTAL & PROTOTYPE WORK, A.I.D. Apd.

NOVOGAGE LTD.

(*For quality and precision*)

JIG-BORING JIG-GRINDING, TOOL ROOM MACHINING

81, Bridge Road, (Nr. HAMPTON COURT STN.) *Tel.: MOLESEY 2763 & 4102* East Molesey, Surrey

---

PROTOTYPES & SPECIAL PURPOSE MACHINES

REPAIRS & SALVAGE BY DEPOSITION

MACHINING, FORGING & FABRICATING

GEORGE MILLS (ENGINEERS) LTD.

BECKENHAM, KENT. TEL: SYDENHAM 5255

Luton Engineering Pattern Co. are prepared to undertake the manufacture of all classes of wood and metal patterns and accuracy and prompt delivery guaranteed.—Send your enquiries to 80A. Princes Street, Luton. 'Phone 961.

DAVIES-CHARLTON (U.K.) LTD.

STATION SAWMILLS, BARNOLDSWICK, VIA COLNE, LANCS. TEL. BARNOLDSWICK 3310

A.I.D. APPROVED

Are specialists in component production for the Aero-Jet engine industry, and can offer capacity on

THREAD GRINDING

THREAD ROLLING

Capstan, Auto and Centre Lathe turning. External, Internal Centreless and surface grinding. Horizontal, vertical and profile milling. Drilling, Tapping and Honing.

QUOTATIONS FOR LARGE OR SMALL QUANTITIES

IMMEDIATE CAPACITY AVAILABLE

Capstan Work up to 1½in. Bar and 6in. Chucking

Milling, Drilling, Grinding

Boring and Assembly Work

Also Hardening for the Trade

A.I.D. and A.R.B. approved

B. TOONE (NOTTINGHAM) LTD

NEWDIGATE ST.

NOTTINGHAM

Tel.: 76661-2-3

PROTOTYPE & PRODUCTION

ELECTRONIC WIRING, COIL WINDING, INSTRUMENTATION & TESTING

SETON CREAGHE ENGINEERING LTD.,

G. W. Trading Estate, Park Royal Road, N.W.10.

A.I.D. ELGAR 3356/7 A.R.B.

Metal Fabrications ⅛in. Thickness, spot welding, profile cutting. A.I.D. approved. Specialists in quick delivery. BANKFIELD ENGINEERING CO., LTD., Crossens, Southport 'Phone: 87427.

CROYDON TOOL

AND **CASE HARDENING** SPECIALISTS

EXPERTS IN ALL HEAT TREATMENT OF METALS

CYANIDE HARDENING · ANNEALING · SHOT BLASTING

KEEN PRICES · WE COLLECT AND DELIVER

UNION ROAD, WEST CROYDON. PHONE: THORNTON HEATH 5222

THREAD GRINDING

Immediate capacity available for Thread Grinding—8in. by 30in., keen prices for long runs. Also fast turn round on Cutter. Universal, Surface Grinding. A.I.D. Approved.

Groundwork Products Ltd.

1, Station Close, Potters Bar, Middx. Tel.: Potters Bar 2550

CASTINGS

ECLIPSE FOUNDRY

& ENGINEERING CO. (DUDLEY) LTD.

SEDGELEY ROAD WEST, TIPTON • STAFFS.

GREY IRON	ALUMINIUM	NON-FERROUS	MAZAK
Jobbing Casting up to one ton	*Sand & Die Castings*	*Gunmetals Phosphor-Bronze*	*Pressure Castings*

Repetition Machine Moulded Work

STAINLESS STEEL SPECIALISTS

Fabrication, welding and X-ray inspection, pressings and machined parts.

THE TAYLOR RUSTLESS FITTINGS COMPANY, LIMITED

Ring Road,

Lower Wortley,

Leeds, 12

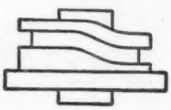
Capacity Available for Prototypes. design proving and component machining in small, medium and large batches in all materials including stainless and synthetic products. We are used to precision limits and delivery promises are a "must" at, of course, competitive prices. A.I.D., A.R.B.

HUNTLEY & SPARKS, LTD., Wandle Road, London, S.W.19. Liberty 2446.

Classified Advertisements (*CONTRACT WORK, contd.*)

CAM CUTTING *by* MANIFOLD

ACCURATE CAM MILLING OF FINEST QUALITY



is being produced on our special-purpose machines which can cut up to 34in. diameter and to any form you may require—and—just to be different— 3 dimensional cams too!

MANIFOLD MACHINERY
COMPANY LIMITED
SUFFOLK WORKS
660 GREAT CAMBRIDGE ROAD
ENFIELD · MIDDLESEX

ENFIELD 5353

IACW/C/I

IDEAL
HARDENING CO., LTD.
DAVIS ROAD, CHESSINGTON, SURREY

HEAT TREATMENT SPECIALISTS
HARDENING OF EVERY DESCRIPTION AND SANDBLASTING
Tel.: ELMBRIDGE 6556-6567

CANADA—ENGINEERING CAPACITY AVAILABLE

British manufacturer well established near Toronto with finest precision engineering plant will undertake contracts requiring high standard of workmanship, e.g. for transmission equipment, machine tools etc.

Apply BOX Z207, MACHINERY, Clifton House, Euston Rd., N.W.1

WOOD & METAL
PATTERNS
HAND MACHINE OR SHELL MOULDING
Keen Quotations Good Delivery
B. LEVY & Co. (Patterns) Ltd.
1-5 OSBERT ST., LONDON, S.W.1
Telephone: VICtoria 1073 & 7496

Capacity Available, Press Tools, Jigs. Fixtures. Production of Metal Pressings. Prototypes and Jobbing. Light Assemblies.
ELLIOTT & WEST,
587, Liverpool Road, N.7. 'Phone: NORth 2366.

Induction hardening and brazing, etc. We collect and deliver
Shot blasting.
PRECISION HEATING LTD.
142A Canbury Park Road, Kingston-on-Thames Surrey. *Phone: KINgston 1468*

Cylindrical and Internal Grinding, max. swing 8in., capacity available. Close limits. Modern plant. A.I.D. approved.—WARD ELECTRIC CO. (NORWOOD), LTD., 44, Chapel Road, West Norwood, S.E.27. Gipsy Hill 1020.

• • MACHINING • •

AUTO TURNED PARTS
FINE TOLERANCES, MAX. DIA. $1\frac{3}{8}$in.
INDEX SS & GRIDLEY MULTI AUTOS
THREAD CHASING MANUFACT'RS
ROLLER BOX TOOL HOLDERS
BENTON ENGINEERING CO. LTD.
Tonbridge Road, Harold Hill, Essex
Ingrebourne 4213

ABBEY **HEAT TREATMENTS** LTD.
PLAZA WORKS, HIGH STREET, MERTON, S.W.19
FOR ALL TYPES OF HEAT TREATMENT.
WE COLLECT - WE DELIVER
TELEPHONE: CHErrywood 2291

Multi-spindle and Single-spindle Auto Turning up to 2in. bar capacity, capstan turning from the bar up to $2\frac{1}{4}$in. dia., chuck work up to 14in. dia., thread milling, milling, shaping, drilling, etc., capacity available. Any tolerance and quantity. Satisfaction absolutely guaranteed.—UNICORN PRODUCTS, LTD., 119-121, Stanstead Road, Forest Hill, S.E.23. 'Phone: FORest Hill 7688 (3 lines

Classified Advertisements (*CONTRACT WORK, contd.*)

PRECISION TURNED PARTS
A.I.D., A.R.B., C.I.A. & I.F.V., APPROVED
AUTO and CAPSTAN QUANTITIES
Send your specification to:
AYLESBURY TURNED PARTS (True Screws) LIMITED
Britannia St., Aylesbury, Bucks.
Tel.: Aylesbury 2424 (3 lines)

E. R. LATTIMER LTD.
SHAKESPEARE STREET, SOUTHPORT
'Phone: Southport 57696/7.

Offer a very comprehensive service for Small to Medium Component and Sub-Assembly Manufacture incorporating:
- Capstan, Auto & Centre Lathe Turning
- Horizontal, Vertical & Profile Milling
- Centreless, Surface & Internal Grinding
- Lapping and Honing
- Drilling, Tapping & 2nd Operation Lathe Work
- Mazak Pressure Die Casting up to 6 oz. weight.

Our new and extended Toolroom is now in operation with full facilities for TOOL DESIGN AND MANUFACTURE.

We are fully approved by A.I.D. and A.R.B.

FINE LIMIT GRINDING
MILLING, TURNING, DRILLING.
Complete Service Offered.
SETON CREAGHE ENGINEERING LTD.,
Trading Estate, Park Royal Road, N.W.10
A.I.D. ELGar 3356/7 A.R.B.

AUTOPRODUCTIONS LTD.
Automatics: Single Spindle
Index "18" "24" "36" "52" "B.42"
Multi Spindle: 1in. and 1¼in. Wickman
Capstan
Drilling
Milling
Centreless Grinding
Polygon Turning
Chemical Blacking
CAPACITY AVAILABLE
53, Green St. Sunbury-on-Thames
Phone 2499

Immediate Capacity Available, on single spindle Automatics up to 1¼in.—JAN PRECISION SCREWS, 33, Woodthorpe Road, Ashford, Middlesex. 'Phone: Ashford 4524

PRECISION & GENERAL MACHINING
including
Thread Milling · Radial Drilling
Metal Spinning
A.I.D. and I.F.V. Approved. Enquiries invited.
Surplice & Tozer Eng. Co., Ltd.
Acre Works, Windsor
Windsor 1657 & 1844
Member of the Metropole Group

CENTRELESS GRINDING

ALL TYPES OF FORM, THROUGH AND PLUNGE

A.I.D. & A.R.B. APPROVED **BAR GRINDING** Tel.: POP 6157 & 7088

$\frac{1}{16}$in TO 5in. DIA. UP TO 15ft. LONG
IMMEDIATE CAPACITY ON CAPSTAN, MILLING
CENTRE LATHES, AUTO AND ALL TYPES OF GRINDING
REDCAR ENGINEERING CO. LTD.
HOLLY ROAD WORKS, TWICKENHAM, MIDDLESEX

WE WOULD WELCOME YOUR ENQUIRIES FOR :–
- **MILLING**—Horizontal & Vertical.
- CENTRE LATHES to 38in. Dia.
- CAPSTANS to 2¼in. Dia.
- PLANING TO 6ft. x 3ft. x 3ft.
- **BORING**—Horizontal & Vertical.
- **Cylindrical Grinding** to 20in. Dia. x 84in.
- **Surface Grinding to 24in. x 8in.**
- **Drilling and Thread Tapping.**

A.I.D. APPROVED
BOWES ROAD ENGINEERING CO. LTD.
BOWES ROAD, NEW SOUTHGATE, N.11. 'Phone BOW 2284/5/6

Automatic Work Up to 1⅝in. Immediate capacity available—TRUE ENGINEERS, LTD., Wharf Lane, Bourne End, Bucks. 'Phone 1316.

Automatic and Capstan Capacity Available up to 2in. dia.—WILLIS ENGINEERING, 65A, High Street, Hampton Hill, Middlesex. Molesey 4273.

Automatic Turned Parts, Press Work, Press Tool Making, Capstan and Centre Lathes, Milling, Drilling, Thread Milling. Capacity available.—PARKER ENGINEERING (KINGSTON), LTD., 200-202, Cambridge Road, Kingston-on-Thames. KIN. 5501.

Planing Capacity, Heavy or Light Turning up to 5ft. diameter. Special machines to customers' design. F. ATKINSON & SONS, London, LTD., 65, King's Cross Road, W.C.1. Terminus 4050.

Immediate Capacity Turning, capstans, milling, drilling, die and tool making.—MILLS ENGINEERING PRODUCTS, LTD., Barnet. Tel.: BARnet 6744.

Metal Spinnings. Immediate capacity for metal spinnings and sheet metal work. A.I.D. approved.—HIGHBURY METAL SPINNING CO. (1955), LTD., 30, Highbury Place, N.5. CANonbury 2906.

Horizontal Production Milling for the trade. Slots, flats, squares, etc., of all descriptions milled on latest plant. Keen prices for long runs, satisfaction guaranteed.—UNICORN PRODUCTS, LTD., 110-131, Stanstead Road, Forest Hill, London, S.E.23. Telephone: Forest Hill 7688 (3 lines).

ROSSER & RUSSELL LTD.
Queen's Wharf, Hammersmith, LONDON, W.6.
Telephone: RIVerside 4161.
GENERAL ENGINEERS AND MANUFACTURERS OF SPECIAL MACHINERY TO CUSTOMERS DESIGN

PLOUGH GRINDING
24 hr. Service
High Speed Service Tool Co. Ltd.
Maple Road, Surbiton, Surrey.
Elmbridge 1135-6-7.

Capstan and Turret Lathe Capacity available up to 4½in. diameter bar and 22in. diameter chucking. Castings and Forgings a speciality. Milling, drilling and centre lathe turning. High class work with prompt delivery. Enquiries invited to:—WHITWAM & ELEY, 22/24, Stafford Road, W.3. Acorn 8364.

Automatic Capacity Available on Index single spindle autos. up to 2in. dia.—ARTHURS ENGINEERING, Hersham Trading Estate, Molesey Road, Hersham, Surrey. 'Phone: Walton-on-Thames 5119.

Capstan Capacity Immediately available, 8 B.A.—1½in. Steel or Brass. Large stocks of raw materials:—SACRON, LTD., 7, Chiswick High Road, W.4. Tel. CHIswick 3595

Capstan Capacity Immediately available 10 B.A. to 1¼in. B.M.S. Stainless, Brass, etc. All materials in stock.—CHISWICK ENG., LTD., Pluckington Place, Southall, Middlesex. Tel.: Southall 2247.

High Precision Grinding of Tungsten Carbide and Steel Tools. Accurate profile grinding and progression tools a speciality.—S. T. LTD., 22-26, Upper Mulgrave Road, Cheam, Surrey. 'Phone: Vigilant 0074/5

SHEARING, BENDING, ROLLING, STAMPING,
up to ¼in. plate. Rotary coil slitting and allied services. Sheets and plate in stock.
SHELMERDINE & MULLEY LTD.
EDGWARE ROAD, CRICKLEWOOD, N.W.2.
GLAdstone 7677-8-9.

Classified Advertisements (*CONTRACT WORK, contd.*)

Classified Advertisements (*CONTRACT WORK, contd.*)

LET US BE YOUR MACHINE SHOP

WE INVITE YOUR ENQUIRIES FOR:

Capstan, turret and centre lathe work: milling-all types-internal, surface and universal grinding, G S I P jig-boring, drilling, shaping, honing, etc. also for tool work. Ours is a complete machine shop to meet your every need.

A.I.D and A.R.B. Approved

MARSDEN & SHIERS LTD. DAVIS ROAD · CHESSINGTON · SURREY · Phone ELMBRIDGE 5333-4

CAPACITY AVAILABLE

High Precision Components
A.I.D. and A.R.B. approved.
Capstans up to 2in.
Centre Lathes 7½in.
Milling and Tooling.

W. G. HEATH AND COMPANY, LTD.
5 Princess Square, Plymouth

CAPACITY AVAILABLE

Nos. 3A, 7 and 10 WARDS; 36in. Vertical BULLARDS MILLING MACHINES and CENTRE LATHES

TASKERS OF ANDOVER
(1932) LTD.
WATERLOO IRON WORKS
ANDOVER HANTS.
TELEPHONE: ANDOVER 2312

Auto Screw Products, Ltd., Castle Works, Tipton Road, Dudley. Tel.: Dudley 5103-4. Capacity available for automatic screw machine work, capstan milling, drilling and presswork. Repetition products for all industries made to customers' specifications in any quantity. Nuts, bolts, screws, general turning, tool design and manufacture.

PRECISION MACHINING CAPACITY PROTOTYPES AND SPECIAL PURPOSE MACHINES

- Turning up to 36in. swing 7ft. 6in. B.C.
- Horizontal and Vertical Milling
- Capstans. Grinding and Fabricating

SAMUEL H. JENKINS,
Rougham Hill, Bury St. Edmunds
Telephone 944

LEYTON
ENG CO LTD
EST: 1929
BEECHCROFT ROAD

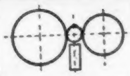
Aircraft and engine servicing tools
Machine tooling equipment
Precision work
Machine parts
Turning, milling, hardening, grinding
Complete machine-unit assemblies

Tel: WAN 5540 & 3343
Telegrams: LEQUIP LONDON E18
Cables: LEQUIP LONDON

SOUTH WOODFORD
LONDON E.18

CAPACITY FOR
CENTRELESS GRINDING...

·01in UP TO 3·50in. DIA. TO PRECISION LIMITS ON 'CINCINNATI' AND OTHER WELL KNOWN MAKES OF MACHINES



ALLEYNE FOSTER ENG Co LTD
ESTABLISHED IN 1924
59 South St., Epsom, Surrey. Epsom 2198

Centreless Grinding is the answer to many production problems. We specialise in it, and so perhaps can help you. We have capacity from $\frac{1}{16}$in. up to 3in. diameter for all types of centreless grinding and can also make your complete components on our Autos and Capstans. (Up to 1$\frac{1}{16}$in. diameter.)
We believe our prices are as competitive as any, and we know our deliveries are better than most. 'Phone or write for quotation or ask for our representative to call. We collect and deliver.—FITZNER, LIMITED, 197-199, Kings Road, Kingston-on-Thames. Tel.: KINgston 1451.

A.I.D. Approved.
CENTRELESS BAR GRINDING.
Close Tolerances to your Requirements.
Quick Delivery.
L. BURKINSHAW & CO. (SHEFFIELD) LTD.
Oughtibridge, Sheffield. Telephone 40812

THE AVENUE ENGINEERING CO
GENERAL ENGINEERING CAPACITY
7, Warner Yard, Warner Street, Mount Pleasant, Clerkenwell, E.C.1
'Phone: TERminus 2209

Thread Milling for the Trade up to 6in O.D. and 5in. I.D. Any thread, any quantity. Keen prices for long runs. Satisfaction guaranteed
UNICORN PRODUCTS LTD
119-121 Stanstead Road, Forest Hill London S.E 29 Telephone: Forest Hill 7688 (3 lines).

Telephone:
WALTON-ON-THAMES
6099

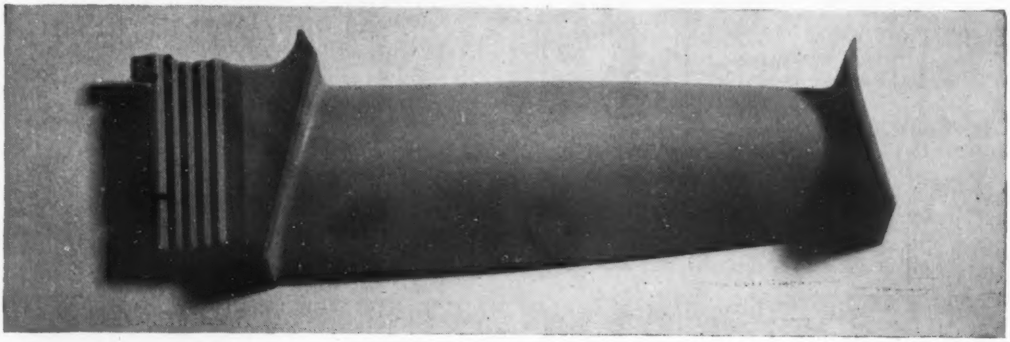
T. J. HARRINGTON & SON LTD
AUTO PRODUCTION MULTI & SINGLE SPINDLE
TRADING ESTATE · MOLESEY RD. · WALTON-ON-THAMES
SURREY

ASHTEAD
for
- CENTRELESS GRINDING
- EXTERNAL GRINDING
- THREAD MILLING

A.I.D. & A.R.B. APPROVED

ENGINEERING CO. LTD.
Grove Road, Ashtead, Surrey
Phone: ASHTEAD 802.
Capstan and Centre Lathe Work
Milling · Drilling · Shaping · Slotting
ESTABLISHED 1920.

If we can make *this* – we can make anything!



Factory Floor area—175,000 sq. ft. Machining capacity—virtually unlimited!
We manufacture—among many other things—gas and steam turbine blades, crankshafts, valves and velocity joints.
Our large-scale production resources are at your service; equally we invite you to make full use of our extensive design and development departments.

BRD

COMPANY LTD · PRECISION AND GENERAL ENGINEERS

A member of the Guest, Keen & Nettlefolds Group of Companies

ALDRIDGE, STAFFS. TELEPHONE: WALSALL 6551/9

Capstan Capacity Available, ½in. to 1½in. Stainless, H.T., B.M.S., etc. No quantity too small.—ACME WORKS, Pluckington Place, Southall. Middx. Tel: Southall 2247.

• PRESS WORK •

Presswork Up to 40 Tons, Circular and surface grinding on latest J. & S. machines. Tools designed and made for the trade, or your article produced throughout in our works. A.I.D. approved. Enquiries welcomed.—WEMBLEY TOOL CO., LTD., 2, Bridge Road, Willesden, N.W.0. WIL. 6667/8.

TREVENA & GLOVER LTD

Specialists in Intricate Presswork

309-312 ICKNIELD STREET
BIRMINGHAM 18.

Quality contacts for the Electrical Industry.

Small and Medium Presswork in all ferrous and non-ferrous metals.

Telephone: B'ham Northern 0258.

ON AIR MINISTRY LIST
CONTRACTORS TO THE G.P.O.

SUB-MINIATURE PRESSINGS
and multi-stage precision press work in all materials
PROMPT DELIVERIES
G. A. PRECISION PRODUCTS LTD
No. 2 Factory, Darkes Lane
Potters Bar, Middlesex
Potters Bar 6895

Pressings in All Metals Up to 60 tons. Press tools manufactured in our own toolroom. Light assemblies. Domestic Electrical and Mechanical. All finishes. A.I.D. and A.R.B. approved. Advice and estimates given free. Inquiries to:
METAL COMPONENTS, LTD.
Dolphin Road, Shoreham-by-Sea, Sussex.
'Phone: Shoreham-by-Sea 2224/5.

Metal Pressings

TO ANY TOLERANCE
SHAPE OR QUANTITY

SERVICE and PRECISION at COMPETITIVE PRICES

ECONOMIC STAMPINGS LTD.
DISRAELI STREET, LEICESTER • TELEPHONE 33333
MEMBER OF THE BENTLEY GROUP

A.I.D., C.I.A., A.R.B., APPROVED

WELDING & FABRICATIONS

PRESSINGS

PRESS CAPACITY UP TO 1000 TONS
· ALL MATERIALS ·

POLARCOLD LTD.,
CONGLETON · CHESHIRE TEL. 2401/3

Classified Advertisements (*CONTRACT WORK, contd.*)

PRESSWORK
SMALL AND MEDIUM
(Including Deep Drawing)
We can provide:
MATERIAL · TOOLING · METHOD
PRODUCTION & FINISHING
Free Delivery Greater London Area
A.I.D. Approved.
H. G. SANDERS & SON LIMITED
Gordon Road, Southall, Middlesex
Telephone: SOUthall 5611

Presswork Up to 50 Tons, Including deep drawing. Long or short runs. Customers' tools and materials acceptable. Tooling and designing.—BIRCH & JACQUES (TOOLMAKERS), LTD., Hersham Trading Estate, Walton-on-Thames. Tel.: W-on-T 5379.

Pressings and Stampings, Ltd., Eccleston Road, West Ealing, W.12. Presswork up to 150 tons. Double action deep-drawing guillotine 8ft. by 10 S.W.G. Spot welding.—Assembly. Tool making and electro-plating.—'Phone: Ealing 3667-8.

Press Work Capacity Available up to 1,500 tons. Bed area 6ft. 6in. by 4ft. Enquiries welcomed.—GULF RADIATORS, LTD., Penarth Road, Cardiff.

• TOOLMAKING •

Press Tools
JIGS
FIXTURES
GAUGES
JIG BORING
ON NEW 4G SIP JIG BORER
THE MITCHAM JIG & PRESS TOOL Co. Ltd.
BENEDICT RD., MITCHAM, SURREY
Telephone: Mitcham 3635

DORMER & WADSWORTH LTD
PLASTIC MOULDS
PRESS TOOLS
JIGS
FIXTURES, ETC.
51-53 BICKERSTETH RD., MITCHAM RD., TOOTING, LONDON, S.W.17
TELEPHONE BALHAM 1006 (2 LINES)

SIGN OF KEMWORTHY
A GOOD TOOL
Send Us Your Enquiries
'PHONE: LIBERTY 5203
THE KEMWORTHY JIG & PRESS TOOL COMPANY LTD.
HIGH STREET, COLLIERS WOOD, LONDON, S.W.1

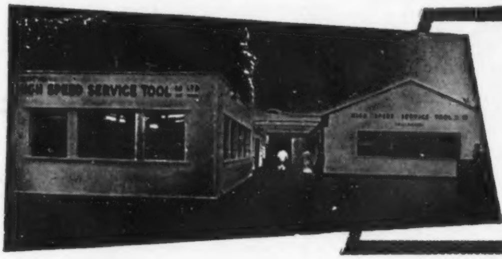
KEMP
PRECISION TOOLING LTD
37 JUNCTION ROAD, CROYDON, SURREY
TELEPHONE: CROYDON 5658
PRESS TOOLS, JIGS
GAUGES, MOULDS
SPECIAL PURPOSE MACHINES
PROFILE GRINDING
PRECISION COMPONENT PRODUCTION
JIG BORING

COVENTRY GRINDERS LIMITED
AID & ARB Approved *Phone: 73344/5*
GAUGES, FORM TOOL, COMPONENTS
A complete Gauge, Tool Room and Inspection Department at your service including over 50 grinding machines. Send us your enquiries for Centreless, Internal, External, Blanchard, Surface, Jig, Optical Form Grinding as well as for your Gauge and Tool Work.

CHIS 5842. **R. E. CARDER LTD.** CHIS 4611.
1 & 2, Chiswick Common Road, London, W.4
JIGS — TOOLS — AND PRESS TOOLS
UNIVERSAL GRINDING
—JIG BORING, GENERAL
GOOD CLASS MACHINING WORK—
DESIGN OFFICE & DEVELOPMENT WORK

CENTRAL ENGINEERS (HERNE HILL) LTD.
- **JIGS—FIXTURES**
- **PRESS TOOLS—GAUGES**
- **PRECISION GRINDING**

Enquiries Invited
Forsyth Rd., Sheerwater Estate, Woking, Surrey. *Phone:* **Woking 5192-5193**



THE FIRM WITH HALF A DOZEN JIG BORERS for PRESS TOOLS etc.

HIGH SPEED SERVICE TOOL CO. LTD.
Maple Road, Surbiton, Surrey. Elmbridge 1135-6-7
STUDER PROFILE GRINDING A SPECIALITY.

A.I.D. A.R.B.
Member of the Gauge & Toolmakers Association

- **MOULDS** Compression and Injection Plastic
- **MOULDS** Pressure Diecasting
- **MOULDS** Rubber and Gravity
- **JIG & FIXTURES**
- **PRESS TOOLS**
- **PRESS WORK up to 25 tons**
- **AUTOMATIC & CAPSTAN TURNED PARTS**

TO BE *PRECISE* IT'S
Camdentools
21-22, HONYWOOD ROAD, BASILDON, ESSEX.
Phone: Basildon 20506/7.

MacDowall

JIGS, FIXTURES
PRESS TOOLS &
GAUGES
PRECISION ENGINEERS
SPECIAL MACHINERY

MACDOWALL EQUIPMENT COMPANY LIMITED
NORTH STREET ROMFORD ESSEX

ROMFORD 61981

TOOLROOM AND PROFILE GRINDING CAPACITY AVAILABLE
FORM CUTTERS A SPECIALITY
PROTOTYPE WORK
GOOD DELIVERIES:
FIRST CLASS WORK

S. E. WAKELIN & CO. LTD.,
204, Birchfield Road,
Birmingham, 19.
EST. 1893 *'Phone Nor. 8201/3*

Press Tools, Jigs and Fixtures, light Pressings up to 10 tons.—SPENCE TOOLS, LTD., 361a, Oxford Avenue, Trading Estate, Slough. Tel.: Slough 22394.

MOULDING PRESS CAPACITY
Bakelite Moulding Presses. 25 ton. Capacity Immediately available at favourable rates.
Apply:— S. ALLCOCK & CO. LTD., STANDARD WORKS, CLIVE ROAD, REDDITCH, WORCS.

Kellering and Cam Profiling capacity up to 8ft. by 6ft. or 6ft. diameter.

ARMYTAGE BROS. (KNOTTINGLEY), LTD.,
The Foundry, Knottingley, Yorkshire.
Telephone: Knottingley 2743/4.

ENGINEERS & PRESS TOOLMAKERS

Speciality—Press Tools For The Tin Box Trade
DIE FORGINGS · POWER PRESS REPAIRS
H. & G. HOPTON (Est. 1870)
219-221, BLACKSTOCK RD, LONDON, N.5.
Telephone: Canonbury 9444/5

HIGH QUALITY
PRESS TOOLS
MULTI-OPERATION TOOL
• SPECIALISTS •
STAMPINGS IN ALL MATERIALS
FIXTURES - JIGS - MOULDS
SPECIAL PURPOSE MACHINES
W. T. Atkin (TOTT) Ltd.
178 ST. ANN'S ROAD, LONDON. N.15.
Telephone: STAMFORD HILL 6686/7

PRESS TOOLS
GROSVENOR WKS. (HOLLOWAY) LTD.
253, SUSSEX WAY, HOLLOWAY, N.19.
and at STATION ROAD, WOOD GREEN.
Phone: ARCHWAY 1033/9
METAL STAMPING,
JIG BORING,
PRODUCTION HEAT TREATMENT OF STEEL.
JIGS & FIXTURES

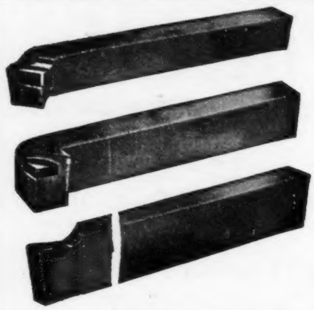
Classified Advertisements (*CONTRACT WORK, contd.*)

JIG BORING
ON SIP JIG BORERS
by
EDMONTON TOOL & ENG. CO. LTD
141, HERTFORD ROAD, EDMONTON N.9
TELEPHONE: EDMONTON 4412/3
SPURS, SPIRALS, BEVELS, WORMS & WORMWHEELS
GEAR CUTTING

PRECONOMY CO LTD
PRECISION
Jigs and Fixtures
Moulds and Press tools
ECONOMY
Eastfield Side, Sutton-in-Ashfield, Notts

PRECISION PRESS WORK
● Double action deep drawing
● Double roll feeds
★ Own tool room
HOLLY ENGINEERING (Drayton) LTD
Colham Avenue, Yiewsley, Middlesex
Telephone: West Drayton 2870

SPECIALITIES



KENNAMETAL
The Super Grade Carbide of World Wide Reputation
ALEXANDER SOCKET SCREWS, LTD.
Guns Lane, West Bromwich, Staffs.
Telephone: West Bromwich 1931 (5 lines)
Telegrams: "Viking, West Bromwich"

BRITISH SPRINGS & WASHERS
B&SW
WILLIAM FINUCANE (SPRINGS & PRESSINGS) LTD. A.I.D. A.R.B.
ELGAR 3757/8/9
16A HILLSIDE, STONEBRIDGE PARK, LONDON, N.W.10.

TIME RECORDERS—Sales—Rental Service. Tel. HOP 2239. TIME RECORDER SUPPLY & MAINTENANCE CO., LTD., 157/159, Borough High Street, London, S.E.1

Machine Engraved Feed Dials. Scales, Nameplates, Labels, etc., in Metal and Plastics. Quick Delivery.—O. H. KAMPF & CO., Tanyard Works, Beaminster, Dorset. 'Phone: Beaminster 440.

MACHINE ENGRAVED RULES
WHITTAM & CO.
Specialists in
Machine Rules, Scales, Circular Dividing, Standards, and all types of Steel Rules, for the Machine Tool Trades.
Established 1860
Telephone: Pendleton 3117
Claremont Works, Salford, 6.

McCROSKY
(BRITISH MADE)
INSERTED BLADE MILLING CUTTERS
Easy accurate setting with unique Jack-Lock wedge
Sample cutter on request

Write for full details to Small Tools Department.
GEORGE H. ALEXANDER MACHINERY LTD.
82, 83, 84, COLESHILL STREET, BIRMINGHAM 4.

UNIVERSAL BALL BEARING CO. U.B.B.Co. ESTB 1907 HAMMERSMITH
Universal Ball Bearing Co.
111-115 Hammersmith Grove, London, W.6
FACTORS MANUFACTURERS AND REPAIRERS
Phone: Riverside 3262-3-4.
Grams: "Universal Bearing Hammersmith"

BRAND NEW BALL & ROLLER BEARINGS
OVER 4,000,000 IN STOCK IN MORE THAN 4,000 TYPES
BRITAIN'S LARGEST STOCKS
STOCK LIST AVAILABLE
CLAUDE RYE BEARINGS 895-921 FULHAM RD., LONDON S.W.6
RENOWN 6174 (EXT. 24) TELEX 2-3453

When answering advertisements kindly mention MACHINERY.

Classified Advertisements (*SPECIALITIES, contd.*)

FLEXIBLE METALLIC CONDUIT
and solderless couplings

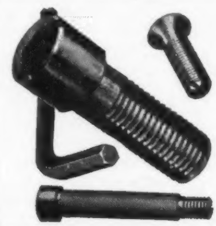
For protecting cables leading to motors, switchboards, starters, etc.

ALL SIZES FROM ½ in. to 3 in.

THE DONOVAN ELECTRICAL CO. LTD.
(Wholesaling Division)
GRANVILLE STREET · BIRMINGHAM 1

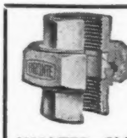
The "Coxeter" Revolving Centre, from 76s. All sizes from stock.—REVOLVING CENTRES, LTD., Oxford.

Tungsten Carbide Tool Manufacturers of standard and special form tools in high speed steel and tungsten carbide. Our range includes reamers, cutters, workrest blades and wear-resistant parts. Carbide supplied to customers' specification and express service given for emergency tooling. DIAGRIT GRINDING CO., LTD., Marden, Kent. 'Phone: Marden 362.



10,000,000
SOCKET SCREWS
IN STOCK
ORDER NOW
Please write for our Monthly Stock Lists.

ALEXANDER SOCKET SCREWS, LTD.,
"Socket Screw Division" Guns Lane, West Bromwich, Staffs.
Telephone: West Bromwich 1931 (5 lines). Telegrams: "Viking, West Bromwich."



'BRONTE'
BRONZE SEATED
PIPE UNIONS
The Popular Steam joint
WALTER SLINGSBY & CO., LTD.
WASK WORKS · KEIGHLEY

"RUBURY"
ROTARY COMPRESSORS & EXHAUSTERS
Manufactured by
THE HAMMOND ENG. CO., LTD.,
Chase Side, Enfield, Middx.
Telephone: ENF. 1823 (4 lines)

ANNOUNCEMENTS

PHOTOGRAPHY

Miles & Kaye, Ltd., 102, South-ampton Row, London, W.C.1. Holborn 6858. Specialists in commercial and industrial photography for over 60 years. All branches of photographic work undertaken.

Photographs by MACHINERY set the standard in engineering publicity. Our studio is one of the best equipped in the country. Ideal for really good photographs of tools, attachments and portable equipment. Mobile units available for taking photographs in black and white or in natural colour in your own or your customers' works. Specimens of work submitted on request.—Full particulars from the SERVICE MANAGER, MACHINERY PUBLISHING COMPANY, LTD., National House, West Street, Brighton, 1.

PATENTS—TRADE MARKS

Kings Patent Agency Ltd., T. R. KING, A.M.I.Mech.E. Registered Patent Agent, 164A, Queen Victoria Street, London, E.C.4. City 6161. Booklet on Request.

The Proprietor of British Patent No. 787483 and U.S.A. Patent No. 2,821,817, for "Improvements in or Relating to Grinding Machines," would accept commercial exploitation by licence or otherwise. Prototype tested. Manufacturers who are interested are invited to write "W.Z." 8, Golborne Road, London, W.10.

PACKING AND SHIPPING

R. & J. PARK, LTD., Dominion Works, Chiswick, England. Export packers, shippers and forwarding agents. Specialists in packing heavy machinery.

BUSINESS FOR SALE

Small Engineering Business for sale, Birmingham district. Manufacturing Jigs, Fixtures, Press Tools, Special Purpose Machines. Established 24 years. First class plant.—For full particulars apply BOX Z194, MACHINERY, Clifton House, Euston Road, N.W.1.

Classified Advertisements (*ANNOUNCEMENTS, contd.*)

BUSINESS OPPORTUNITIES

Sheffield Engineering Firm with comprehensive engineering plant and extensive experience in the design and production of all types of machinery, including special purpose plant, wishes to undertake the manufacture of complete or part assemblies, including assembly line production. Own Drawing Office and Pattern Shop. Technical Representatives in all areas.—BOX L771, MACHINERY, Clifton House Euston Road, N.W.1.

Small Auto Turned Parts Firm with Plant and Modern Premises wishes to contact working Auto Specialists with connections and small capital with a view to partnership.—BOX Z166, MACHINERY, Clifton House, Euston Road, N.W.1.

For Patterns, Blocks, Jigs, Repetition Work in Wood, "Japroc," "Tufnel," etc. No job too small.—Send your enquiries to P.M., 29, Sixth Avenue, Bristol, 7.

Sales, Sales, Sales. May We help you increase your sales in U.K. and/or Export. London Offices/Showrooms/Stores, available and Technical Selling Staff. Machines, Equipment or allied products suitable for marketing through Engineering firms and Undertakings. —Write in confidence to BOX Z197, MACHINERY, Clifton House, Euston Road, N.W.1.

MATERIALS FOR SALE

Surplus Mild Steel For Sale, 20G. to 14G. Offcuts 20G. to 14G. Cold reduced and Hot-rolled Strip Mill 6 by 3 by 22G. terneplate.—R. STEPHENS & SONS, LTD., Bath Street, E.C.1. CLE. 1731/4.

MISCELLANEOUS FOR SALE

Electric Motors, New and Secondhand, over 1,000 always available for sale, part exchange or hire. Prompt repairing service in event of breakdowns.—JOHN RODWELL, LTD., Vicarage Road, Hornchurch 8877/8.

MATERIALS WANTED

Steel, Aluminium, Brass, Sheets, and Offcuts 10 to 24g. Small or large quantities. Cash payments.—DYAS & FOWLE, 41, Loudoun Rd., N.W.8. MAIda Vale 2711, 5477

BRITAIN'S BIGGEST BUYERS

WANT

NEW BALL & ROLLER BEARINGS

OF ALL TYPES & SIZES

CLAUDE RYE BEARINGS

895-921 FULHAM RD. LONDON, S.W.6

RENOWN 6174 (EXT. 24) · TELEX 2-3453

PLANT WANTED

Wanted Urgently

Late Type Machine Tools

Best Prices are offered for latest types of Machine Tools. Send us details of what you have and our representative will call to inspect.

J. B. MACHINE TOOL CO. LTD.

312 BRADFORD ST., BIRMINGHAM 5

Telephone: MIDland 4375

Wanted, Machine Tools and Sheet Metalworking machinery, particularly post-war models.—H. BELL (MACHINE TOOLS), LTD., Walter Street, Leeds, 4. Tel.: 63/7398.

Machine Tools, Power Presses and Sheet Metal Machinery. Single machines or complete plants purchased. Immediate inspection.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1.

MCL

WE ARE KEEN BUYERS OF GOOD MODERN MACHINE TOOLS.

INSPECTION WILL BE ARRANGED AT ONCE.

M. C. LAYTON LTD.

96-98 VICTORIA STREET, LONDON, S.W.1

Telephone: VICtoria 7778/9.

B.G. MACHINERY, LTD., Montgomery Street, Sparkbrook, Birmingham, 11, will pay good prices for Machine Tools of first-class make and in good condition.—'Phone: VICtoria 2351/9.

Machine Tools and Sheet Metal Working Machinery, modern items of all types required.—CHARLES E. MATTHEWS (MACHINE TOOLS), LTD., 34, Gladstone Road, Croydon. (Thornton Heath 1783.)

Harry Kirk Will Purchase modern quality machine tools for cash. Whole plants or individual items.—Full details to:—
HARRY KIRK ENGINEERING, LTD.,
Machine Tool Division,
Brandon Road Works,
Brandon Road, Coventry.
Telephone: Walsgrave-on-Sowe 2213/4.

WANTED!

USED MACHINE TOOLS

We offer generous prices for your plant or accept in part exchange for modern equipment

E·H·JONES (MACHINE TOOLS) LTD

48, HIGH ST. EDGWARE, MIDDX

Telephone: EDGware 4488/9

BIRMINGHAM: MIDLAND 5593

HIGHEST PRICES PAID FOR......

MACHINE TOOLS • PRESSES • PLATE & SHEET METAL WORKING MACHINERY • TIN BOX MAKING MACHINERY • WOODWORKING MACHINERY

Outright purchase or in part exchange

F. J. Edwards Ltd

EDWARDS HOUSE, 359-361, EUSTON RD., LONDON, N.W.1

Telephone: Euston 4681 (7 lines) 3771 (4 lines)

41, WATER STREET, BIRMINGHAM 3 Telephone: CENtral 7606/8

Classified Advertisements (*PLANT WANTED, contd.*)

WANTED
GOOD CLASS MACHINE tools and sheet metal machinery.

EDWIN MILLEN
70 Clerkenwell Road, London, E.C.1
'Phone: Clerkenwell 6064

One Press, 100 tons, 2in. Stroke or adjustable. Double tool feed. Built in scrap cutter. Bed ring type bed. Adjustable timing of feed and roll lift. Balanced slide.—BOX Z167, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, Slideway Grinder, Churchill VA or similar, 6ft. capacity or larger.—BOX V643, MACHINERY, Clifton House, Euston Road, N.W.1.

CENTAUR TOOL WORKS, Birmingham, 18, pay best prices for good modern secondhand Machine Tools by first-class makers. Write or 'phone and our representative will call. 'Phone: EDGBASTON 1118 and 1119. 'Grams: Capstan, Birmingham.

Bliss Styles Type Press No. 3.—Full particulars and price, BOX Z163, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted. Reasonably Modern machine tools and sheet metal working machinery. Best prices paid.—W. FORREST & CO., LTD., Industry Works, Sylvester Gardens, Sheffield, 1. Sheffield 23314/5.

SURPLUS MACHINE TOOLS REQUIRED
OFFER YOUR MACHINES TO
J.E. RAISTRICK LTD.
POYLE TRADING ESTATE
COLNBROOK, SLOUGH.
BUCKS.
TEL: COLNBROOK 2421

WANTED
Horizontal, Vertical Boring Mills; Bullard Vertical Turret Lathe; Radial Drill, Milling Machine, American Made.
BOX P.32, MACHINERY,
Clifton House, Euston Road, N.W.1.

A. LAWRENCE & CO. (MACHINE TOOLS) LTD.
will be pleased to purchase your surplus Modern Machine Tools either on a cash or part exchange basis. Ask our representative to call and inspect.
Welsh Harp, Edgware Road, London, N.W.2
Telephone: GLAdstone 0033

WILLIAM
URQUHART
Props.: Exors.
M. & R. Urquhart
MODERN MACHINE TOOLS
of all types.
GOOD PRICES. Send details to
WM. URQUHART,
1023/27, Garratt Lane, London, S.W.17
Tel: BALHAM 8551

WANTED GOOD MACHINE TOOLS
Offer your Surplus Tools to us. We pay a good price
M. WARD
(MACHINE TOOLS) LTD.
1, KILBURN HIGH ROAD, LONDON, N.W.6
MAIDA VALE 1195-96
Telegrams: Emwarneer, Kil., London
One minute from Kilburn Park Station Bakerloo Railway
2 us.

WANTED
ALL TYPES OF MODERN MACHINE TOOLS
Please write or phone details to:
THE MIDLAND MACHINE TOOL CO. BRADLEY, BILSTON, STAFFS.
Tel.: Bilston 42471/4

WE BUY *Good class* MACHINE TOOLS
SOAG
• *We invite particulars of your surplus Machines*
SOAG MACHINE TOOLS LTD.
7, JUXON ST., LAMBETH, LONDON, S.E.11
Phone: RELiance 7201
Grams: 'Sotoelsog,' London

Gorton Vertical Mill Wanted, 8½D-9J or similar.—BOX Z184, MACHINERY, Clifton House, Euston Road, N.W.1.

Die Casting Machine IMP.96 wanted.—BOX Z203, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, Hydraulic Pump, 3 or 4 throw, motorised, having minimum capacity of 420 gallons per hour at 1 ton per sq. in.—BOX Z204, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, Clipping Press, 60 Tons. Combined clipping and shearing Presses up to 100 tons.—BOX Z210, MACHINERY, Clifton House, Euston Road, N.W.1.

Sentinel Series 23R No. 4 Air Compressor, 300 c.f.m. at 100 lbs. p.s.i., with or without electric motor. To be not later than 1946.—BOX Z209, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted, Hydra Major Oil Burner.—Details to BOX Z218, MACHINERY, Clifton House, Euston Road, N.W.1.

WANTED MODERN MACHINE TOOLS
We pay cash for single machines or complete plants
SEND US DETAILS
IMMEDIATE INSPECTION ARRANGED
SOUTHERN ENGINEERING AND MACHINERY CO.
CONNAUGHT BUILDINGS
TANNERS BROOK, MILLBROOK
SOUTHAMPTON
Telephone: Southampton 73101/2/3

See also Page 142 for adverts received too late for classification

PLANT FOR SALE

HENRY BUTCHER & CO.
Specialists in the
• VALUATION AND SALE OF FACTORIES, PLANT AND MACHINERY •
73 CHANCERY LANE, LONDON, W.C.2
TEL.: HOLBORN 8411 (8 lines) GRAMS: PENETRANCY, HOLB., LONDON

A Good Number of High-class Machine Tools always in Stock.—ELLISON, Cook Street, off Chapel Street, Salford 3, Lancs.

Wanderer Universal Milling Machine. Table 30in. by 10in. Speed 96-1,000 r.p.m., complete with dialling head, toolholders, etc. As new.—BOX T105, MACHINERY, Clifton House, Euston Road, N.W.1.

Several Plain Cylindrical Grinders for sale from 6in. by 18in. to 14in. by 18in. Churchill, Landis and Precimax. Write stating size of interest to BOX Z296, MACHINERY, Clifton House, Euston Road, N.W.1.

Herbert 9S Combination Turret Lathe with taper turning attachment and some equipment. First reasonable offer accepted.—BOX Z286, MACHINERY, Clifton House, Euston Road, N.W.1.

AUTOMATICS—¼in. to 3½in.
Makers: Butterworth, Brown & Sharpe, Cleveland, Gridley.
Also Lathes, Milling and Grinding Machines.
List on request.
A. BUTTERWORTH & CO.
ST. JOHN STREET, ROCHDALE
(Telephone: 48015)

A SELECTION OF USED MACHINE TOOLS AVAILABLE FOR IMMEDIATE DELIVERY

LANG 16in. × 20ft. Lathe, twin saddles.
MILWAUKEE 2H Vertical Miller, 1,400 r.p.m.
CINCINNATI No. 2 Dial type, Vertical and Horizontal Millers.
CHURCHILL 14in. × 36in. Plain Cyl. Grinder.
MATRIX 10 and 21 Thread Grinders.
SNOW OS120 Surface Grinder.
6ft. × ½in. Bending Rolls (New).
KITCHEN & WADE 4ft. 6in. Radial Drill, twin motors.
ASQUITH 3ft. 6in. ODI Radial Drill.

W. FORREST & CO. LTD.
INDUSTRY WORKS,
SYLVESTER GARDENS,
SHEFFIELD, 1.
'Phone 23314/5.

There are HUNDREDS of MACHINES to choose from at
THE F.J.E. MACHINE CENTRE
ISLINGTON PARK STREET, NEAR HIGHBURY CORNER, LONDON, N.1
(on the main A1 Road from the North)

Churchill Redman Profiling Lathe with hydraulic tracing equipment. Capacity 12in. by 40in. Full electrics and fitted coolant supply. Very powerful machine in excellent order, having been reconditioned.—BOX Z365, MACHINERY, Clifton House, Euston Road, N.W.1.

CRAVEN Rigid Heavy Duty Plain Milling Machine. Table 59 in. x 15 in. Power and Rapid Traverse all directions. Prismatic Overarm. Motorised 400/3/50. In first class condition at **£350.**
BOX Z 206
MACHINERY, Clifton House, Euston Road, N.W.1

Barber & Colman No. 3 Gear Hobbing Machine. Cap. up to 5in. dia. gear. Mot.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

Secondhand:
Brown & Sharpe No. 2 Surface Grinding Machine. Capacity 18in. by 6in. M/D 400/3/50.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1. 'Phone: Terminus 0167/8/9.

Asquith 6ft. Radial Drill With power lift to arm and variable speed motor drive to quill.—BOX Z289, MACHINERY, Clifton House, Euston Road, N.W.1.

Cincinnati No. 2 Dial Change Uni. Hor. Mill, high speed machine in very good condition. Table size 52in. by 12in.—BOX Z341, MACHINERY, Clifton House, Euston Road, N.W.1.

New Hobrough 1¼in. Capstan Lathe. Suitable for collet or chucking work also suitable for steel or brass. Prices Chucking Machine—£485. Collet & Bar Machine—£595.—Send for details from PHILIP DE HAVILLAND MACHINE CO., LTD., 64-66, Grosvenor Street, Portsmouth 71033.

REMEMBER...
WARDS might have it!
THOS. W. WARD LTD
ALBION WORKS, SHEFFIELD

Scriven 3-Roll Plate Bending Machine, rollers 14ft. wide, ¼in. capacity.

Archdale 4ft. Radial Drilling Machine, tapping reverse speeds, motorised.

Herbert Filing and Sawing Machine, 15in. square, adjustable table.

Alexander 16in. Cutting-off Machine, 12½h.p., 400/3/50.

Herbert Hacksaw, 13in. blade, belt driven.

Wicksteed Hydrofeed Hacksaw, 16in. blade, 6in. by 6in.

Rex Hydraulic Hacksaw, 18in. blade, 8in by 8in.

Colchester 7in. Centre Lathe, 7ft. gap bed, A.G.H.

Herbert Horizontal Milling Machine, 3ND table 61in. by 15in., 4 spindle speeds.

3,000 K.G. Capacity Avery Hardness Testing Machines, 10in. dia. table (2).

V. & O. 50-ton Inclinable Geared Open Fronted Press.

Crow Harvey Punch, Shears and Angle Cropper, 18in. blade, 27in. throat, heavy duty.

Pels Punch, Shears and Cropper, 12in. blade shear ⅝in., takes 6in. by 6in. by ⅝in. angles.

Craig & Donald Billet Shears, 8in. blade 6in. by 1in. capacity.

Robertson Shears, ½in. capacity, 10 h.p., 28in. blade, 9in. maximum opening. (2)

Robertson 7-roller Plate Flattener, 8ft. 6in. wide, approximately ⅜in. capacity.

Berry 3-roller Plate Bender, 7ft. wide, approximately ⅜in. capacity.

Sweeney Fly Presses, all sizes, 20 available.

Massey 3-cwt. Bottle Forging Hammer, also 3/5 cwt. secondhand.

New 1-cwt. and 2-cwt. Hammers by Massey and Alldays & Onions.

Oliver Planishing Hammer, 29in. gap.

FRED WATKINS (ENGINEERING), LTD. Coleford, Glos. 'Phone: Coleford 2271 (3 lines).

Classified Advertisements (*PLANT FOR SALE, contd.*)

NEW MACHINES

MODERN 2C 1¼in. Cap. Capstan. Complete with bar feed.
DENBIGH C2 Miller, 34 × 10 table. Nine speeds.
MITCHELL 12½in. Lathe. 10ft. 9in. between centres. 4½in. Hollow spindle.
QUALTERS & SMITH 10in. Hacksaw. Two speeds. Coolant Equipment. Hyd. relief.
HARRISON 11in. Swing Lathe. Complete with standard equipment and four-way toolpost.
MODERN 2EE Surface Grinder. 18 × 6 table. Fully Automatic.
MITCHELL 8½in. Lathe. 8ft. bed. 12 speed headstock.
RUSHWORTH 8ft. × ⅛in. Guillotine. Over crank. Full Electrical Equipment.
CARDIFF 8½in. × 48in. Lathe. Coolant. Four-way toolpost. Chucks, etc.
VICTORIA U.3 Universal Miller. 60 × 12½in. table. Rapid traverses all directions.
SMART & BROWN Model 'M' 4in. S.S. & S.C. Lathe. 18in. between centres.
VELOX 7½in. Hacksaw.
COLCHESTER 'Mascot' 8½in. Lathe. Finger tip reverse. Coolant, etc.

MODERN

USED MACHINES

SWIFT 4ft. Superadial Drill. Nine spindle speeds to 1,500 r.p.m. Loose box table. Good condition. **Price £650.**
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe. 17in. Height of centres. 3½in. Hollow spindle, 30in. 4-jaw chuck. Completely checked. **Price £895.**
WANDERER PAO Production Mill. 20 × 8 table. **Price £195.**
INVICTA 4M 18in. Shaper. Late machine Lo volt lighting. **Price £295.**
HERBERT No. 4 Senior Capstan. Ball chuck. Bar feed. Tooling. Recently re-built. Excellent condition **Price £800.**
MITCHELL 14½in. × 7ft. 9in. Lathe. 4½in. Hollow spindle. Overhauled. **Price £1,950.**
REINECKER Vertical Mill. 43 × 10 table. Dial change. As new condition. **Price £1,050.**
WARD No. 7 Comb. Turret. Tooling. Checked. **Price £750.**
ADCOCK & SHIPLEY No. 2 U.V. Miller. Attachments. Good working order. **Price £385.**
RICHMOND S.R.2 Radial Drill. Swivel table, very good order. **Price £375.**
WARD 3A Capstan. Ball chuck. Bar feed. **Price £450.**

MODERN MACHINE TOOLS LTD

GOSFORD STREET COVENTRY
TEL. COVENTRY 22132

★

GOSFORD STREET COVENTRY
TEL. COVENTRY 22132

MARTIN BROS. (Machinery) Ltd.
Telephone: TRAfford Park 1091-2
REBUILDERS OF ALL TYPES OF TOOLS FOR OVER 40 YEARS
PRECISION REBUILDERS TO THE TRADE & GOVT DEPTS
Guaranteed 6 months, Crane Capacity 15 tons

MARTIN BROS OF MANCHESTER

NEW, USED and REBUILT
MACHINE TOOLS
400 ALWAYS IN STOCK
U.K. AGENTS FOR: **H.M.V. (Swedish) Universal Borers, SCOTT SUNDERLAND SHEET METAL TOOLS, BULLOWS COMPRESSORS, C.V.A. CHUCKS, GRANOR CENTRE LATHES.**

EMPRESS WORKS, EMPRESS STREET, CORNBROOK, MANCHESTER 16

Archdale VM30 Vertical Milling Machine with sliding head. Just rebuilt, almost as new.—BOX Z319, MACHINERY, Clifton House, Euston Road, N.W.1.

Carl Unger Camshaft Grinder with master cam attachment. Capacity 24in. by 5in. dia. Will grind multiple throws. Rebuilt machine.—BOX Z379, MACHINERY, Clifton House, Euston Road, N.W.1.

Taylor & Challen B3½ Geared Press, 60 tons, 3in. stroke. Fitted 9in. roll feed. Mot.—WILCOX & CO., Barr Street, Birmingham, 19. NORthern 1234/5.

CHURCHILL REDMAN 24in. SURFACING, BORING AND SCREWCUTTING LATHE. Swing 38in. by 19in. in gap, 16 spindle speeds 14/408 r.p.m. Quick change gearbox for threads 3 to 46 t.p.i.

F. J. EDWARDS LTD.,
359-361 Euston Road, London, N.W.1
EUSton 4681 & 3771

Secondhand:

Bliss 20B, 25-ton Inclinable Power Press. Adjustable stroke ½in.-2½in. M/D 400/3/50.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1. 'Phone: TERminus 0167/8/9.

No. 2 Cincinnati Tool and Cutter Grinder with internal grinding attachment. Condition excellent.—BOX Z387, MACHINERY, Clifton House, Euston Road, N.W.1.

OR.12 Index Single Spindle Automatic with third slide, high speed drilling, etc.—BOX Z383, MACHINERY, Clifton House, Euston Road, N.W.1.

Two Matterson Universal Thread Milling Machines No. 11. Complete with attachments, motorised 400-440/3/50, in excellent condition. £95 each.
EDWIN MILLEN,
70, Clerkenwell Road, London, E.C.1.
'Phone: CLErkenwell 6064.

Bechler 10 mm. Auto with attachment. 1950 machine.
Petermann 10 HS with Comb. attachment. C/shaft.
B. & S. 2G Auto. Motorised. Old but useful. —MAURER, LTD., Cambridge Yard, Hanwell, London, W.7.

New Unused 1958 Ward 2A Capstan.
Footburt 1⅝in. capacity automatic lathe. (Can be seen working.)
Bliss 28-ton Power Press with guards.
Exchange considered for first class centre lathe and/or 70-100 ton Power Press.
D. AYRES JONES & CO., LTD., Queensway, Fforestfach Industrial Estate, Swansea, Glam.

Smart & Brown Internal Grin- der for Bushes, Toolmaking, etc. 1in. dia. approx. 400/3/50. Automatic infeed to head. £175.—BOX Z192, MACHINERY, Clifton House, Euston Road, N.W.1.

INDEX
S.S. AUTOMATICS
No. 24. 1in. £575.
No. 18. ¾in. £455.
400/3/50 Electrics.
BOX No. Z182 MACHINERY
Clifton House, Euston Road, London, N.W.1

Index 36 Auto, Full Equipment including attachments. Index 12/18/25 longitudinal turning attachment, tool holders, unused. Index 24/36/52 tool holders and attachments, unused. Index 20 tool holders and spares. Index bent taps, unused.—WALTON-ON-THAMES 6578.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham, have for sale a quantity of counterbores and countersinks. These are new, and a detailed list may be had on application.

New Gear Cutters, Involute H.S.S. American manufacture No. 3P Cutters 1 to 7. No. 2P Cutters 3 to 8; 1 off each. 14 deg. P.A. £60 the lot to clear.—BOWD ENGINEERING. — BOX Z205, MACHINERY, Clifton House, Euston Road, N.W.1.

Classified Advertisements (*PLANT FOR SALE, contd.*)

NORTON

FOR "NEARLY NEW"

OFFER FROM STOCK—

AUTOMATICS

WICKMAN 5-spindle Bar Automatics 1⅝in. capacity. Serial Nos. 423464/5.

BROWN & SHARPE OOG Bar Automatic, Vertical Slide, Bar Strand, turret, tools, collets. Serial No. 12715.

BORERS

NEWALL Model 24/42 Jig Borer, built 1955.

KEARNS Model 2 and Model OB Horizontal Borers, traversing spindles, facing heads, wartime built.

RICHARDS 48in. Double Upright Vertical Boring and Turning Mill, two swivelling toolboxes on cross slide, built 1938.

CAPSTAN & TURRET LATHES

HERBERT 4BS Bar Capstan Lathe, fitted turret toolholders, pump, bar feed, speeds 30 to 511 r.p.m.

WARD No. 7 Bar Capstan Lathe, bar feed, speeds 20 to 416 r.p.m.

HERBERT No. 20 Combination Turret Lathe, 7½in. diameter spindle, 28in. swing over bed, 97in. distance spindle to turret, Speeds 5 to 201 r.p.m.

CENTRE LATHES

SWIFT 27in. by 17ft. S.S. & S.C. Lathe, swing over saddle 3ft. 4in., swing in gap 6ft. 8in., speeds 2 to 130 r.p.m. Separate feed motor to saddle. Well equipped. Wartime built.

BROADBENT 14in. S.S. & S.C. Gap Bed Lathe, admits 90in. swings in gap 50in., speeds 5·5 to 204 r.p.m. Well equipped Nearly New.

BINNS & BERRY 12½in. S.S. & S.C. Gap Bed Lathe, admits 7ft. 6in. between centres, speeds 12 to 600 r.p.m. NEW.

COLCHESTER MASCOT 8½in. by 54in. All geared Head Centre Lathe, speeds 37 to 600 r.p.m. NEW.

COLCHESTER TRIUMPH 7½in. by 48in. All-geared Head Gap Bed Lathe, speeds 40 to 800 r.p.m. NEW.

WILLSON Mark V 7½in. by 48in., S.S. & S.C. Gap Bed Lathe, admits 48in., speeds 54 to 954 r.p.m. and 37 to 739 r.p.m. NEW.

DEAN SMITH & GRACE Type "A" 7in. by 31in. S.S. & S.C. Gap Bed Centre Lathe, speeds 11 to 490 r.p.m. Serial No. 21303.

REIDEN 7½in. by 40in. S.S. & S.C. Gap Bed Toolroom Lathe, fitted taper turning attachment, pump 3-jaw chuck, speeds 25 to 1,350 r.p.m. NEW.

MITCHELL 6½in. by 64in. S.S. & S.C. Gap Bed Centre Lathe, taper turning attachment, speeds 27 to 400 r.p.m. Nearly New.

STUDENT 6in. by 24in. S.S. & S.C. Gap Bed Lathe, speeds 52 to 1,000 r.p.m. NEW.

WILLSON Mark I 6½in. by 24in. Sloping Bed Type Lathe, speeds 52 to 954 r.p.m. NEW.

MYFORD Super Seven Lathe, 3½in. by 19in., speeds 25 to 2,150 r.p.m. NEW.

DRILLING MACHINES

RICHMOND S.R.2 36in. Radial Drill, elevating table, suds pump. NEW.

JONES & SHIPMAN 30in. Model 921, 2-spindle Manufacturing Drilling Machine. 1½in. capacity, speeds 39 to 825 r.p.m. Table 42in. by 24in.

PROGRESS 3A Pillar Drilling Machine, Circular table. NEW.

GRINDERS

NORTON 10in. by 36in. Hydraulic Horizontal Spindle Surface Grinder, fitted "Humphries" chuck. Toolroom condition.

BURDETT Hydraulic Horizontal Spindle Surface Grinder, capacity 18in. by 6in. by 10 in. NEW.

LANDIS Hydraulic Universal Grinder, type "C" capacity 10in. by 24in. Serial No. 27916.

MYFORD M.G.12 Plain Cylindrical Grinder, capacity 5in. by 12in. NEW.

CHURCHILL HBA Automatic Internal Grinder. Wartime built.

NEWALL Hydraulic 10in. by 36in. Plain Cylindrical Grinder. Wartime built.

MILLING MACHINES Vertical

CINCINNATI No. 4 Dial Type Vertical Milling Machine, table 78½in. by 16½in. rapid and power traverses 42in. by 16in. by 16in. Speeds 18 to 1,300 r.p.m. British built 1941.

BIERNATZKI No. 5 Swivel Head Vertical Milling Machine, table 78in. by 19in., traverses 49in. by 15in. by 35in.

CRAVEN Swivel Head Vertical Milling Machine, table 47in. by 13in., traverses 42in. by 7in. by 12in., speeds 41 to 1,188 r.p.m.

Universal

REIDEN H.F.30 Universal Milling Machine table 59in. by 14⅜in., rapid and power traverses 39⅜in. by 11¾in. by 15¾in., speeds 44 to 1,457 r.p.m. NEW.

VICTORIA U.2 Universal Milling Machine, table 45in. by 11in., power feeds 29½in. by 65in. by 16in., speeds 30 to 1,010 r.p.m. NEW.

RICHMOND No. 3 Universal Milling Machine, table 48in. by 11in., rapid and power traverses 30in. by 8in. by 16in., speeds 20 to 1,000 r.p.m. NEW.

DENBIGH C.4 Universal Milling Machine, table 46in. by 10in., automatic longitudinal feed 36½in., speeds 13 to 400 r.p.m. NEW.

Horizontal

ARCHDALE 20in. Plain Horizontal Milling Machines, table 40in. by 10in., traverses 20in. by 5½in. by 12in., speeds 30 to 615 r.p.m.

CINCINNATI 1/12 Automatic Milling Machine, table 35in. by 10in., speeds 50 to 1,500 r.p.m. British built.

VARIOUS

LOUDON 16ft. by 5ft. by 6ft. Planing Machine, Ward Leonard drive. Four Toolboxes.

CINCINNATI 10ft. by 3ft. by 3ft. Planer with two toolboxes on the cross-rail.

CLEARING 240 ton by 14ft. and 150 ton by 14ft. capacity Press Brakes. Wartime built.

INVICTA 6M 24in. stroke Shaper. NEW.

All machines motorised 400–440 volts, 3 phase, 50 cycles, A.C. supply.
Sole London and South of England agents for BRONX Press Brakes.

W. E. NORTON (MACHINE TOOLS) LTD

GROSVENOR GARDENS HOUSE, GROSVENOR GARDENS, LONDON, S.W.1

Telephone: TATE Gallery 0633-4-5 Cables: Norbros, London

Showroom & Stores: Bridge Works, 342 Queenstown Road (Close Chelsea Bridge) Battersea, S.W.11

Classified Advertisements (*PLANT FOR SALE, contd.*)

MIDLAND

C.V.A. No. 20 Single spindle automatic. Third slide and slotting attachment, range of collets, etc.

BROWN & SHARPE OOG Automatic.

ACME GRIDLEY 1in. cap. six spindle Bar Auto. Bar feed, collets, tooling and live spindle.

HERBERT Junior Chucking Auto. Very well equipped.

FISCHER K.D.M. 11/70 Copying Lathe. Automatic.

HERBERT No. 4 Capstan A.G.H. eight speeds. 30 to 750 r.p.m. Covered bed.

BROWN & SHARPE No. 2 Universal Grinder. $14\frac{1}{2}$in. swing by 30in. b.c. Well equipped. First-class condition.

PILKINGTON 5-cwt. Air-operated Power Hammer. Almost new.

MILWAUKEE 2 C.E. Horizontal Miller. Vertical and slotting heads. Speeds to 2,000 r.p.m. As new. 1954.

BIERNATZKI Heavy Duty Horizontal Miller. Speeds 29 to 1,500 r.p.m. Quick power all ways. As new condition. 1952.

HERBERT No. 7 Combination Turret Lathe. Screw-cutting. $2\frac{1}{2}$in. hollow spindle.

HERBERT No. 21 Combination Turret Lathe. 34in. swing. $7\frac{1}{2}$in. hollow spindle. Screw-cutting and taper-turning.

HILLE Leadscrew Type Thread Miller. Well equipped. First-class condition.

SWIFT $12\frac{1}{2}$in. Gap Bed S. & S. Lathe. 9ft. b.c. Belt drive.

LANG 15in. b.c. S.S. & S.C. Lathe.

HERBERT 15S Vertical Miller.

THE MIDLAND MACHINE TOOL CO.

BRADLEY, BILSTON, STAFFS. Bilston 42471/7

No. 4 Senior "Herbert" "Eloptive" motorised Chucking Capstan Lathe with air chuck and chasing. Flamard bed. Max. swing over bed covers, $16\frac{3}{4}$in. dia. 8 spindle speeds, 125-1,500 r.p.m. Auto feed to saddle and cross-slide. New 1947.—LEE & HUNT, LTD., Crocus Street, Nottingham.

Milwaukee Model 4K Vertical Mill. Table size 80in. by 16in. Spindle speeds 12 to 1,200 r.p.m. Power rapid traverse in all directions. Power feeds to Vertical Head. Rebuilt almost as new.—BOX Z358, MACHINERY, Clifton House, Euston Road N.W.1.

THE SPOT ● TO WATCH!

FOR GOOD CLASS SECOND-HAND MACHINES AT LOW COST

B.S.A. $1\frac{1}{4}$in. cap. AUTOMATIC.
GIDDINGS & LEWIS 25RT Hor. Borer.
WARD 1A, 2A Capstans.
HERBERT No. 1, 2S, 2B, 4S, 4BS Capstans.
HERBERT 3A (Chucking) Capstan.
WARNER & SWASEY No. 2, 3 and 5 Capstans.
PALLAS No. 2 Surface Grinder.
NORTON 18in. by 6in. Surface Grinder.
CHURCHILL 'HDY' Internal Grinder.
HEALD 72A Internal Grinder.
WOTAN Internal Grinder.
PRECIMAX 10in. by 48in. Plain Grinder.
MAXNOVA Profilomatic Type B. Copying Lathe.
HOLBROOK 8in. by 36in. S.S. & S.C. Lathe.
CHURCHILL-REDMAN 8in. by 30in. A.G.H. Gap Bed Lathe.
PROGRESSIVE 8in. S.S. & S.C. Gap Bed Lathe.
KARGER 5in. by 24in. S.S. & S.C. Lathe.
HOGARTH 7in. by 40in. A.G.H. S.S. & S.C Lathe.
VOLMAN 7in. by 60in. A.G.H. Gap Bed Lathe.
CINCINNATI 3/36 Hydromatic Duplex Mill.
WADKIN Vert. Mill, 2,100 to 3,100 r.p.m.
CINCINNATI No. 3 Vertical Mill.
CINCINNATI Hydrotel Mod. EM. 28in. Vertical Mill.
MANN Universal Thread Mill.
ADCOCK & SHIPLEY No. 3 Hor. Mill.
ARCHDALE 30in. Vertical Mill.
EDGWICK No. 1 Speedmil.
SENTINEL 25T Power Press.
C.V.A. 25T Dieing Press.
WADKIN Fixed Head Router.
Variable Speed H. GEAR Units, 3 h.p.

Phone: EDGWARE 4488/9

E·H·JONES (MACHINE TOOLS) LTD

Phone: B'ham. Midland 5593

48, HIGH STREET, EDGWARE, MIDDX

Newman for MACHINE TOOLS

BORING MACHINES

UNION Horizontal Boring Machine, Model BFT.100, $3\frac{11}{16}$in. dia. travelling spindle, 24in. dia. facing head. (1957.)
RICHARDS Type PRT Horizontal Type Floor Boring Machine, $3\frac{1}{2}$in. dial travelling spindle and 28in. dia. facing head.
FRORIEP Vertical Boring Mill, table diameter 39in., maximum turning capacity 52in. (1955.)
RICHARDS Double Column 6ft. Vertical Boring Mill, maximum turning capacity 72in.

DRILLING MACHINES

KITCHEN & WADE 28V10 Single Spindle Vertical Drilling Machine, No. 4 M.T.
HETTNER Radial Drilling Machine, having 10ft. Radial Arm elevating column type.
KITCHEN & WADE 4ft. 6in. Radial Drilling Machine.

NEWMAN INDUSTRIES LTD.
YATE BRISTOL

Telephone: CHIPPING SODBURY 3311

"Electraulic" 20-ton Press with Horn for Sale. For punching, riveting, forming or assembling, etc., for special shape work or cylinders and trunks. Self-contained oil pump motor driven, 440/3/50. Stroke 3in. Centre to back $10\frac{1}{2}$in.—Photo., etc., from F. J. EDWARDS, LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

NEWALL USED MACHINE DIVISION

HAVE CAPACITY AVAILABLE FOR REBUILDING MACHINE TOOLS UP TO A CAPACITY OF 30 TONS.

INVITE ENQUIRIES FOR THIS CLASS OF WORK AT THE FOLLOWING ADDRESS

★

The Newall Used Machine Division

Oundle Road Works,
ORTON LONGUEVILLE, PETERBOROUGH
Telephone 6116

Classified Advertisements (*PLANT FOR SALE, contd.*)

STEDALL SPOT
Machine Tool

New Precision Tapping Machines:—

ESSEX 22 ...	**£83 10s.**
ESSEX 23 ...	**£86 10s.**
ESSEX 26 ...	**£333**

Immediate delivery.—Prices include 3-phase electrical equipment.

Stedall Machine Tool Co.
145-157 ST. JOHN ST. CLERKENWELL E.C.1
Phone: **CLERKENWELL 1010**

One New 'KUHNE' Single Blow Rivet Forging Machine for Sale. Semi Hot Type, for Rivets up to ⅞in. capacity and 6in. in length. Complete with 35 H.P. motor and Starter. Output 90 rivets per minute. Nett weight 17·7 tons. Complete with dies ½in. to ⅞in. rivets. Price £7,900-0-0. Delivered C.I.F. British Port.

For further particulars apply—

FOREST ENGINEERING (PTY) LTD., P.O. Box 6738, Johannesburg, South Africa.

Secondhand:

Willson 7½in. A.G.H. Gap-bed Centre Lathe, 42in. b.c. M/D 400/3/50.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1. 'Phone: TERminus 0167/8/9.

Edgwick Diecasting Machine, type A1611. Cold chamber machine in excellent condition, with A.G.M. Bale out furnace.—BOX Z170, MACHINERY, Clifton House, Euston Road, N.W.1.

Cincinnati No. 3 Vertical Dial Change Mill. Spindle speeds 18 to 1,300 r.p.m. Completely rebuilt, any inspection invited. Table size 54in. by 10in. Sliding head with power feed. London.—BOX Z351 MACHINERY, Clifton House, Euston Road, N.W.1.

No. 3U "Adcock & Shipley" motorised all-geared Universal Milling Machine. Table 50in. by 12in., has longl. travel of 30in. Spindle speeds 20-1,400 r.p.m. Auto feed ½in.-50in. per min. all movements. Rapid traverse by separate motor. Good equipment. Post war machine.—LEE & HUNT, LTD., Crocus Street, Nottingham.

Ward 2A Capstan Lathes. 1½in. bar and 1½in. bar and chucking. Motor (400/3/50) and belt driven.—HICKS MACHINERY, LTD., 26, Addison Place, London, W.11. Tel.: PARk 2333.

MACHINE TOOLS FOR IMMEDIATE DELIVERY FROM LONDON STOCK ALL WITH 400–440 volts, 3 phase, 50 cycle ELECTRICS.

HERBERT No. 36 Heavy Duty Duplex Miller, working surface of table 57in. by 14in.
LUMSDEN 71-LEO Open-fronted Vertical Spindle Surface Grinder, table 48in. by 18in.
JAMESON 3-dimensional Hydraulic Copying Routing and Profiling Machine, capacity B to F 12in., R to L 23in. by 6in. high.
VOMAG Precision Fine Boring Machine, table 29½in. by 11in., hydraulic feeds.
CHURCHILL No. 3 Planetary Cylinder Grinder, capacity 22in. by 48in.
JONES & SHIPMAN 10in. by 27in. Universal Grinder.
CHURCHILL PAH Universal Grinders, 10in. by 24in. capacity, hydraulic feeds.
HANSON WHITNEY 8in. by 16in. External and Internal Thread Miller.
CINCINNATI No. 2 Dial-Type Horizontal Miller, table 49in. by 12in.
KNIGHT No. 20 Vertical Milling and Boring Machine, canting table 9in. by 40in.
ORMEROD 26in. Stroke Motor-driven Slotter.
ACME-GRIDLEY Model RPA-8 eight spindle 6in. Chucking Automatic.
CHURCHILL PBH Universal Grinder, capacity 16in. by 50in.
RYDER No. 6 Six-spindle Verticalauto, capacity 6in. by 6in.
STANLEY 14½in. Centre Gap Bed Boring and Facing Lathe.
GOSS & DeLEEUW 5-spindle 8in. capacity Chucking Automatics.
GOSS & DeLEEUW 8-spindle 6in. Chucking Automatics.
LANG 8½in. by 8ft. S.S. & S.C. Toolroom Lathe.
ARCHDALE 36in. Sensitive Radial Drill.
RYDER No. 18 Vertical Autos, motor driven, max. length of workpiece 26in.
CHURCHILL OSV Vertical Spindle Hydraulic Surface Grinder, table 60in. by 10in.
B.S.A.-GRIDLEY Model R 1⅝in. capacity 4-spindle Auto.
PFAUTER RS1 Vertical Gearhobber, capacity 29½in. by 11in. by 3 d.p.
GLEASON 18in. Combination Gear Lapping and Testing Machine.
HEY Gear Tooth Rounding Machine.
PITTLER Model RE.II.60 Turret Lathes, high speed, 8⅝in. centres, 2⅜in. hollow spindle.
LANDIS 10in. by 24in. Type C Hydraulic Universal Grinder.
CINCINNATI Model O8 Production Miller, table 18¾in. by 6¾in.
CINCINNATI No. 2 Vertical Dial-type Millers, table 52¾in. by 12½in.
WICKMAN $\frac{7}{16}$in. capacity Sliding Head Precision Auto.
CLIFTON & BAIRD 30in. Metal Cutting Bandsaw, table swivels for mitring.
LIBBY 2H8 Universal Combination Turret Lathe, 13½in. centres, hole through spindle 8½in.
ARCHDALE 28in. Horizontal Plain Miller, table 49in. by 13in., 3-way power feeds.
WANDERER OFV Vertical Mill, swivelling head, table 39½in. by 10in., top speed 1,075.
CHURCHILL HBA Automatic Sizing Hydraulic Grinding Machines, swing inside water guard 12in., over table 19in.
CHURCHILL-CONOMATIC 6-spindle 1¼in. capacity Automatics.
CHURCHILL No. 1 Motorised Hydraulic Internal Cylinder Grinders, capacity 10in. by 18in.

LITTON'S
MACHINE TOOL CO. LTD,
372-378, Old Street, London, E.C.1
Telephone: SHOreditch 4814/5.
Telegrams: "Galloon, Avenue, Lond."

K·E·N·T

Stevens & Bullivant No. 10 Rotary Swaging Machine. £125.
Ahcol Rotary Milling Machine. £95.
Smith & Mills 16in. Shaping Machine. £275.
Herbert & Weingarten 30-ton Power Press. ½in. to 3½in. Adj. Stroke. £375.
G. & L. "Grand Rapids" No. 25 Hori. Spindle Surface Grinder. £275.
Colchester "Triumph" 7½in. Lathe. A.G.H. £225.
Weisser 6½in. Lathe. A.G.H. £275.
Herbert O Capstan. £110.
Corona 2AX No. 2 M.T. Drilling Machine. £67 10s. 0d.
Zimmerman Hori. Boring Machine, 2in. travelling spindle. £325.
Parkson Horizontal Milling Machine. Table 51in. by 11in. overall. £195.
Speedax No. 2 Riveter. £35.
Jos. Heap 1in. Tangential Screwing Machine. £165.
Ward OE Capstan. Bar feed. £165.
Peterman P.10 S.S. Auto. Extensive collets and equipment. £275.
Willson 7½in. S.S. & S.C. Lathe. £235.
Lang 8½in. S.S. & S.C. Lathe. T.T. A.G.H. £695.
Van-Norman 22L. Hori-Vert. Milling Machine. £695.
Archdale 18in. Vert. Milling Machine. Fixed head. £250.

All machines mot. 400-440/3/50.

K·E·N·T MACHINERY & ENGINEERING CO.
Datchelor Place, London, S.E.5.
Telephone ROD 4149.

Lorenz Gear Shaper. Model S.O.O. Capacity 7½in. PD × 2in. face. Motorised.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

Matrix No. 10 Universal Thread Grinder with many attachments, including internal spindle. Very nice condition.—BOX Z334, MACHINERY, Clifton House, Euston Road, N.W.1.

Newman for MACHINE TOOLS

MILLING MACHINES

MILWAUKEE No. 2H Vertical Milling Machine, table 50in. by 10in.
SUNDSTRAND Hydro-Screw Rigidmill Automatic Production Milling Machine, table 7in. by 14in., table traverse 48in.
MILWAUKEE No. 4H Plain Horizontal Milling Machine, table 74in. by 15½in.
VICTOMATIC Automatic Cycle Production Milling Machine, capacity 50in. by 10in.
REED-PRENTICE No. 5 Vertical Milling Machine, table 68in. by 16in.

PLANING, SLOTTING AND SHAPING MACHINES

MUIR 17in. Stroke Vertical Slotting Machine.
STOCKBRIDGE 20in. Shaping Machine.

MISCELLANEOUS

SHEEPBRIDGE 20in./22in. Hydraulic Cold Circular Sawing Machine.

NEWMAN INDUSTRIES LTD.
YATE · BRISTOL
Telephone: CHIPPING SODBURY 3311

Classified Advertisements (*PLANT FOR SALE, contd.*)

EDGWICK No. 2 Univ. Miller.
SWIFT 9 × 72in. Gap Bed Lathe.
LA POINTE 3L8 Horiz. Broach, 64in. stroke.
BARNES No. 2 Horiz Hones.
WARD No. 7 Comb. Turret Lathe, 1940.
NILES 27in × 27ft. Twin Saddle Lathe.
ACME-GRIDLEY RAC6 Chuck Auto.
CHURCHILL No. 1 Planetary Grinder.
ORCUTT HM24 Gear Grinder, 1944.
CINCINNATI 1/18, 2/24 Prod. Mills.
RYDER WELLMAN Horiz. Borer, 3 insp.
B. & S. OOG S.S. Autos. 1942.
LA POINTE 2SL Horiz. Broach.
VICTORIA U2 Mill, with dividing hds., 1955.
ACME GRIDLEY 2⅝in. S.S. Auto, 1942.
MODERN 6in. × 18in. Surface Gdr., 1953.
CHURCHILL OSV 40in. × 10in. Vertical Spindle Surface Grinder, 1942.
ARCHDALE 30in H.D. Pillar Drill, 1942.
GISHOLT 4, 5 and 1L Turret Lathes, 1941-43.
WARNER & SWASEY 3, 5 and 3A Turrets.
HERBERT 2D, 4, 4 Senior Turret Lathes.
B. & S. No. 3 Vert. Mill, 1942.
WARD 2A and 3A Capstans, 1942.
ARCHDALE 18in. and 30in. Vert. Mills, 1942.
CINCINNATI 2MH & No. 2 Plain Mills, 1942.
HEALD 48A S. End Borematics, 1941-44.
DEFIANCE No. 5 Hor. Borer, 3in. sp., 1941.
B.S.A. ⅝in. S.S. Automatics, 1941.
CINCINNATI 1L and No. 2 Vert. Mills, 1942.
B. & S. No. 2 Universal Grinders, 1941.
NEWALL 10 by 24/48 Grinders, 1942.
MONARCH Magnamatic Prod. Lathe, 1946.
ORCUTT 5in. by 36in. Spline Grinder, 1944.
V.D.F. 10in. by 72in. Centre Lathe, 1941.
CINCINNATI 3/24, 3/36 Hydromatics, 1945.
HERBERT 0, 1 and 33 Plain Mills, 1940.
P. & W. 12B 2-spindle Profiler, 1941.
KITCHEN & WADE No. 2 Cyl. Hone, 1940.
CHURCHILL NB 6in. × 18in. S. Gr., 1942.
CHURCHILL Centreless Gr., Model EC, 1940.
COCHRANE BLY No. 55 Cold Saw, 1940.
INDEX OR12 S.S. Auto, ½in. cap., 1940.
FOOTBURT 1in. cap. S.S. Automatic, 1943.

All modern fully motorised machines.

J. B. MACHINE TOOL CO., LTD.
312/4, BRADFORD STREET,
BIRMINGHAM, 5.
TEL.: MIDLAND 4375.
AND AT WOLVERHAMPTON.

S&V

New & Used Machine Tools

DENHAM Heavy Duty A.G.H. Gap Bed Centre Lathe. 11in. centre height, 9ft. 6in. between, 44in. swing in gap, 4⅛in. H.M. Motorised 400/3/50.
BROWN & SHARPE No. 13 Universal and Tool Grinder.
ELECTRISKA 1¼in. cap. Geared 27in. Column Drilling Machine. (New.)
POLLARD 4 Spindle Drill. No. 2 M.T. Mot.
EDWARDS 4ft. by 14g. Universal Swing Beam Folder.
HENRY & WRIGHT 100-ton Dieing Press, modern machine with full equipment.
BLISS No. 20 Power Press, 1½in. stroke.
NORTON Hori. Spindle Surface Grinder, 36in. table with 24in. by 8in. mag. chuck.
ARCHDALE 14in. Horizontal Mill, 26in. by 8in. table, 3 available.
PALLAS Vertical Mill, sliding/swiv. head, table 44in. by 12in., old machine, good condition.
PALLAS HO Horizontal Mill, 30 by 7 table. Motorised 400/3/50.
HERBERT No. 1 Capstan, dead length, chuck, bar feed.

STRAIGHT & VINES LTD.
MINT STREET, BOROUGH,
LONDON, S.E.1.
Telephone: HOP 4364.

CINCINNATI No. 3 Dial Type Vertical Milling Machine. Speed range 18-450 r.p.m.
HERBERT 47V Vertical Milling Machine. Speed range 21-750 r.p.m.
ARCHDALE 30in. Vertical Milling Machine. Speed range 29-522 r.p.m.
PARKSON INA Universal Milling Machine. Speed range 17-450 r.p.m. Comprehensive equipment.
PARKSON 2T Universal Milling Machine. Speed range 15-360 r.p.m. Comprehensive equipment.
BROWN & SHARPE No. 10 Production Milling Machine. Speed range 55-1,800 r.p.m.
HERBERT 9S Combination Turret Lathe. Speed range 14-400 r.p.m.
WARD 7 Combination Turret Lathe. Taper turning. Bar feed and chucking. Speed range 37-750 r.p.m. Comprehensive equipment.
WARD 7, 3A, 2A, 1A, OE Capstan Lathes. Bar feed.
CHURCHILL 16in. by 50in. Universal Grinding Machine. Comprehensive equipment. Unused.
NEWALL Type L 10in. by 36in. Plain Grinding Machine.
JONES & SHIPMAN 10in. by 27in. Plain Grinding Machine.
B.S.A.-LANDIS Type C 6in. by 18in. Plain Grinding Machine.
NORTON 6in. by 18in. Surface Grinder.
CHURCHILL 16in. Ring Grinder.
CHURCHILL 24in. Ring Grinder.
CHURCHILL 42in. Ring Grinder.
SCRIVENER 2 Centreless Grinder.
HENDEY 24in. by 168in. S.S. & S.C. Lathe. Speed range 14-560 r.p.m.
F.L.C.B. 17in. by 10ft. S.S. & S.C. Lathe. Speed range 1.08-152 r.p.m.
OLDFIELD & SCHOFIELD 15in. by 8ft. S.S. & S.C. Gap Bed Lathe. Speed range 6.5-332 r.p.m.
OLDFIELD & SCHOFIELD 12½in. by 7ft. S.S. & S.C. Gap Bed Lathe. Speed range 12-400 r.p.m.
CINCINNATI Type LT 8in. by 4ft. 6in. S.S. & S.C. Lathe. Speed range 16-392 r.p.m.
LANG 9in. by 5ft. 6in. S.S. & S.C. Lathe. Speed range 8.75-240 r.p.m.
DEAN SMITH & GRACE 7in. by 3ft. 6in. S.S. & S.C. Gap Bed Lathe. Speed range 11-490 r.p.m.
DEAN SMITH & GRACE 7in. by 2ft. 6in. S.S. & S.C. Gap Bed Lathe. Speed range 11-490 r.p.m.
DENHAM 6½in. by 3ft. 0in. S.S. & S.C. Gap Bed Lathe. Speed range 10-400 r.p.m.
KITCHEN & WADE 4ft. No. 5 M.T. Radial Drill. Speed range 20-1,000 r.p.m.
TOWN 3ft. No. 3 M.T. Radial Drill. Speed range 20-1,000 r.p.m.
TOWN 3ft. No. 2 M.T. Radial Drill. Speed range 126-1,450 r.p.m.
ASQUITH Type E.G.C. 6ft. Girder Type Radial Drill. Speed range 183-580 r.p.m.
ASQUITH Type E.G.C. 8ft. Girder Type Radial Drill. Speed range 21-830 r.p.m.
HEALD 47B Borematic.
KEARNS Type OA Horizontal Boring Machine.
B.S.A. ⅝in. Automatic Screwing Machine.
KENCO 6-3 Screwing Machine. Comprehensive equipment.
CLIFTON & BAIRD Punching and Cropping Machine. Capacity 4½in. by 4½ in. by ½in. angle.
BIGWOOD 4-Roll Bending and Straightening Machine. Capacity 4ft. by ⅜in.

Modern Machines—Motorised 400-440/3/50.
Fully Overhauled — Six Months Guarantee.

WESTERN MACHINE TOOLS (SWANSEA) LTD.
72, MANSEL STREET, SWANSEA.
Tel.: 50061/2.

Two C.V.A. 20 Single Spindle Automatics in excellent condition. Will accept £750 each. Fitted third slides. A slotting attachment, outside feeding attachment and some spares available at half list price.—BOX Z259, MACHINERY, Clifton House, Euston Road, N.W.1.

URQUHART

USED LATE TYPE MACHINES

LATHES

LANG, Late Type 8in. centre by 54in., in gap, 28in. Norton Feed Box, Camlock Nose, heavy duty, motorised.
SELECTA A.G.H. 6½in. centre by 42in., gap 23in., Norton feed box, motorised.
WILSON 7½in. by 40in., gap bed, motorised.
BERRY A.G.H., 6½in. centre by 32in., in gap 26in., motorised.
MITCHELL 7½in. by 42in. by 25in. gap, A.G.H., motorised.
CHURCHILL CUB Lathe, 6in. by 24in., A.G.H., mot. 415/3/50.

CAPSTANS AND AUTOS

WICKMAN Auto., cap. 10mm., motorised.
WARD 2A, A.G.H., bar feed, motorised.
WARD No. 7 A.G.H. Bar feed, ball chuck, etc., Motorised.
WARD 1A Capstans, 1in. collet cap. H.S. range up to 4,130 r.p.m. Ball chuck, bar feed, mot. coolant pump, 400-440/3/50 A.C.
HERBERT 1S Capstans, ⅞in. collet cap. Draw-in collet and bar feed, 16 speeds 18/4,020 r.p.m. Hand feed turret and cross slide. Mot. coolant pump, 415/3/50.
HERBERT No. 0 Capstans, ½in. cap. Dead length air chucks, 12 speeds 93/6,000 r.p.m., mot. coolant pump, 415/3/50.
BOLEY & LEINEN Precision Capstan. Model S.R.26. Collet cap. 1in., mot. 415/3/50.

MILLING MACHINES

WADKIN High-speed Vert. Mill, table 12in. by 36in., mot. 415/3/50.
LEINHARD Engraver, ratio 0-0 to 20-1, mot.
TAYLOR HOBSON Engraver, "C" type, motorised.
ARCHDALE 28in., table 49in. by 13in., mot. in base.
ARCHDALE 20in. Horizontal. Table 40in. by 10in. Dial type speed change 30 to 615 r.p.m. Dial feed. Mot. 415/3/50.
ARCHDALE 18in. High-speed Vertical WB30. Table 34in. by 10in., 6 speeds 500/2,000 r.p.m. Mot. 415/3/50.

GRINDING MACHINES

ABRASIVE Surface, No. 3, motorised.
CHURCHILL Hyd. Vert. Surface (plough), cap. 18in. by 36in., segmental wheel 18in. dia. Humphrey mag. chuck, 12in. by 36in., mot. 415/3/50.
LANDIS Hydraulic Cylindrical Grinder, 12in. by 48in., mot., reconditioned.
NEWAL Hydraulic Cylindrical Grinder. 12in. by 24in., mot.
K.S. Internal Grinder, $\frac{3}{16}$in. to 1½in. dia., int. cap. Power feed to table, auto. sizing feeds, mot. 415/3/50. Late type machine, ex. con.
OLIVETTI Automatic Hydraulic Cylindrical Grinder. Type R4/1200, 14in. swing by 48in. between centres. Plunge cut. Mot. 415/3/50.

SHAPING MACHINES

BERRY 14in. Shaper, gearbox drive, mot.
PRATT & WHITNEY Slotter, 5½in. stroke, tilting ram.

PRESSES AND SHEET METAL, ETC.

RHODES Stagger Press, 25 ton, throat 24in.
OLIVER Quick Work Shear, cap. ½in., throat 30in.
RHODES Flufeed Hydraulic Guillotine, 6ft. by 14ft. Gauge, Micro stops.
THERMIC Muffle Furnace, 15in. by 24in. by 12in., has heated pyrometer 1,000 deg. C.
T. & C. B1½ and B2, motorised.
RHODES 40 ton inc., motorised.
BLISS No. 8, late type, motorised. £100.

WILLIAM URQUHART
Head Office:—
1023, Garratt Lane, London, S.W.17
Showrooms—
Ace Works, Plough Lane, Tooting, S.W.17
Phone: WIMbledon 6341

ARCHDALE 5ft. Radial Drilling Machine, low base, No. 4 M.T. in spindle. A.C. Motor drive (two motor type).
KOLB 3ft. 6in. Radial Drilling Machine, low base, loose box table, No. 4 M.T. in spindle. Motor drive through gear box.
TAYLOR & CHALLEN No. 1220 (20-ton) Inclinable Power Press, 3in. stroke. Motorised and fully guarded with automatic guards.
HERBERT No. 9S Combination Turret Lathe, 415/3/50, 4½in. Hollow Spindle. Good equipment.
WARD No. 8 Combination Turret. Lathe, 415/3/50. 4½in. Hollow spindle. Taper turning attachment.
WARD No. 2A Capstan Lathe, 415/3/50. Power feed to turret and saddle. Bar feed and automatic ball chuck. Two speed motor.
CHURCHILL-REDMAN 7-NM S.S. & S.C. Heavy Duty Gap Bed Lathe. All-Geared, 400-440/3/50. Q.C.G.B. Admits 2ft. 3in. between centres, swing in gap 26in. dia. 2¾in. H.S. Taper turning attachment.
LODGE & SHIPLEY S.S. & S.C. Manufacturing Lathe. All-Geared Head. 18in. swing by 5ft. between centres. 1⅝in. Hollow spindle. Q.C.G.B.
LE BLOND REGAL S.S. & S.C. Precision Lathe for bench mounting. 10in. swing by 2ft. 2in. between centres. Q.C.G.B. ¾in. Hollow spindle All-Geared head, 415/3/50.
TWO **B.S.A.** 9in. Single Spindle Chucking Automatics. 400-440/3/50. Good equipment including toolholders, chucks, pick-off gears, etc.
VICTORIA U.2 Universal Milling Machine, 415/3/50. Table W.S. 40in. by 10in. Spindle speeds 25 to 900 r.p.m. With dividing heads, swivel vice, pump and fittings.
CINCINNATI 1/18 Automatic Milling Machine. British Built. Table W.S. 35in. by 10in. Spindle speeds 50 to 1,500 r.p.m. Automatic table cycle. 415/3/50.
VAN NORMAN Plain Horizontal Milling Machine all-geared, 415/3/50. Table W.S. 64in. by 14in. 18 Spindle speeds 32 to 1,250 r.p.m.

R. V. Gray.

Minerva Road, Park Royal, LONDON, N.W.10.
Telephone: ELGar 4841/2.

G. M. BUCKINGHAM LTD.

CLEARANCE OFFER OF BRAND NEW MACHINE TOOLS

Prior to closing our Windsor Street Showrooms, and the opening of new premises, we are offering a number of brand new items at greatly reduced prices, including Lathes, Millers, Shapers, Radials, etc.
If you are contemplating the purchase of new machines, it will pay you to contact us while a good selection remains unsold.
Short term offer only.

Closed for Annual Holiday until 11th August, 1958

8, Clarendon Ave., Leamington Spa.
Telephone 1215

SELECTIONS FROM OUR LARGE STOCK OF MODERN MACHINE TOOLS

(All machines motorised 400-440/3/50 and overhauled unless otherwise stated)

LATHES, CAPSTANS AND AUTOS.

WILLSON 6½in. × 36in S.S. & S.C. Lathe.
WARD 1A Capstan, B.C. and B.F.
HERBERT 2D Capstan, B.C. and B.F.
WARD 10 Combination Turret Lathe.
HERBERT No. 8 Combination Turret Lathe, covered bed.
SMALLPIECE No. 6 M.S.L. Multi-Production Lathe.
HERBERT 5A Capstan chucking m/c.
HERBERT No. 4 Capstans, 4 chucking machines.
ACME 5W Turret Lathe, chuck machine.
HERBERT Model O Capstan, pneumatic bar chuck and bar feed.
WARD 3A Capstans. B/C and B/F. 2 M/cs.
WARD 2A Capstans, B/C and B/F.
D.S.G. 13Z **MINOR** 6½in. by 31in. S.S. & S.C. Lathe.

DRILLS.

KITCHEN & WADE 32in. Radial 3 M.T. Sens.
ARCHDALE Mod 2220 Pillar, 1½in. cap., p/feeds.
HERBERT Type "C" Pillar, 1½in. cap., p/feeds.
JONES & SHIPMAN Fig. 921, 30in. Pillar, 2in. cap., p/feeds.

GRINDERS.

CINCINNATI No. 2 Tool and Cutter.
CHURCHILL Mod. H.A.Y. Internal Hyd.
NEWALL 10in. by 36in. Plain Hyd.
ABRASIVE Mod. 3B Surface, cap. 8in. by 24in.
CHURCHILL Mod. N.B. Horizontal Surface, cap. 6in. by 18in.
SNOW Mod. OS72 Hor. Spindle Surface, hyd. cap. 72in. by 18in.
PALLAS No. 0 Surface, cap. 14in. by 5½in.
NEWALL Mod. L.U. 12in. by 36in. Hyd. Universal.
B.S.A. LANDIS Type "C" 6in. by 18in. Hyd. Plain
CHURCHILL Mod. B.Y. Hyd. Angle Head Automatic, plain.
ABWOOD Vert. Spindle, Surface, cap. 18in. by 6in. (AS NEW.)
CHURCHILL Mod. H.C.B. Hyd Auto Sizing. Internal.

MILLERS.

MILWAUKEE Mod. 2HL. Plain.
KENT-OWEN No. 1/14 Hyd. Plain. 2 m/cs.
VAN NORMAN No. 2L Plain, table 45in. by 10in.
CINCINNATI Mod 0S Vert., table 24in. by 6in.
HERBERT No. 1 Plain, with auto. feed.
ARCHDALE 20in. Plain, with rapid traverse.
CINCINNATI 18in. Manfg. Model O.K., table 34in. by 12in.
ARCHDALE 14in. Plain, table 27in. by 8in., long. travel 14in.
ASQUITH Type V Vert., table 50in. by 14in., long. travel 28in.

MISCELLANEOUS.

NOBLE & LUND 11in.-16in. Cold Saw
T.M.A. Mod. G2 Pantograph Engraving Machine.
CLEVELAND Rigidhobbers, 2 machines, mod. 120, 1 machine mod. 130.

M. WARD (MACHINE TOOLS) LTD

PHONE: MAIDA VALE 1195-1196
GRAMS: EMWARNEERS·KILB·LONDON

1, KILBURN HIGH ROAD KILBURN·LONDON·N.W.6

SALES ENTERPRISE LIMITED,

for MILLING MACHINES

K. & T. MILWAUKEE.	2CE Universal—Table size: 52in. by 12in. 2CE Vertical—Table size: 52in. by 12in.
VICTORIA.	U.2 Universal—Table size: 45in. by 11in. V.2 Vertical—Table size: 45in. by 11in. U.3 Universal—Table size: 60in. by 12½in. Used U.1—Table size: 40in. by 11in. (Three machines available)
WOODHOUSE & MITCHELL.	369 Turret Mill—Table size: 36in. by 9in.

274, Manchester Road, Audenshaw, MANCHESTER. *Phone. DRO.* 1335/6

Pfauter Gear Hobbing Machines, models RS¼ to RS1½. In excellent condition.—BOX Z371, MACHINERY, Clifton House, Euston Road, N.W.1.

OOG Brown & Sharpe High speed single spindle Automatic 5/16in. capacity. With third slide and motorised slotting attachment. 15,700 series in excellent condition.—BOX Z262, MACHINERY, Clifton House, Euston Road, N.W.1.

" Humphries " Type OC-B Open Fronted Upright Roll Feed Press for sale. Adjustable stroke, 1/16in. to 2in. Pressure exerted 10 tons. Bed 14½in. by 9½in. Double left to right roll feed, feed rolls 2½in. long by 2in. diameter. Complete with two coil holders. Arranged motor drive 400/3/50.—Photo, etc., from F. J. EDWARDS, LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

Classified Advertisements (*PLANT FOR SALE, contd.*)

Classified Advertisements (*PLANT FOR SALE, contd.*)

Classified Advertisements (*PLANT FOR SALE, contd.*)

Cashmores

Selection of Machine Tools from Stock

CENTRE LATHES

LANG 8½in. S.S. & S.C. Lathe to admit 4ft. 0in. between centres.
COLCHESTER MASCOT 8½in. S.S. & S.C. Lathe, to admit 4ft. 6in. between centres.
New **MITCHELL OF KEIGHLEY** 12½in. S.S. & S.C. Lathe, to admit 8ft. 9in. between centres.
VOLMAN 8in. S.S. & S.C. Gap Bed Lathe, to admit 4ft. 6in. between centres.
New **MITCHELL OF KEIGHLEY** 10½in. S.S. & S.C. Lathe, to admit 7ft. 5in. between centres.
F.L.C.B. 13in. S.S. & S.C. Heavy Duty Lathe, to admit 17ft. between centres, 2 saddles.

CAPSTAN LATHES

WARD 3A Capstan Lathe, with collet chuck and bar feed, 1½in. capacity.
WARD No. 7 Capstan Lathe, with covered bed, arranged for chuck work, 2½in. hollow spindle.
WARD 2A Capstan Lathe, with collet chuck and bar feed, 1½in. capacity.

BORING MACHINE

TULLIS Horizontal Boring Machine, Floor Type with 3½in. traversing spindle, 9ft. 0in. by 2ft. 6in. tee-slotted baseplate.

UNIVERSAL GRINDING MACHINE

LANDIS 16in. by 36in. Universal Grinding Machine, with hydraulic feed.

DRILLING MACHINE

GIRARD 5ft. 0in. Radial Drilling Machine. Elevating Arm, with Loose Box Bed. Two-motor type.

PLAIN GRINDING MACHINE

CHURCHILL 10in. by 36in. Hydraulic Plain Cylindrical Grinding Machine.

MILLING MACHINES

HERBERT 23V Vertical Milling Machine. 68in. by 17in. table.
CINCINNATI No. 3 Dial Type Vertical Milling Machine, 62½in. by 15in. table, motorised.
ARCHDALE 18in. Vertical Milling Machine, 38in. by 10in. table.
CRAVEN "Rigidmill" Production Milling Machines, working surface of table 39in. by 13in., spindle speeds 25-400 r.p.m. Two machines available.
EDGWICK 18in. Production Milling Machine, working surface of table 26in. by 12in.
New **VICTORIA** U1, U2 and U3 Universal Milling Machines.
ARCHDALE 20in. Horizontal Plain Milling Machine, 40in. by 10in. table.
CUTTAT HYPERMIL Production Milling Machine, 43in. by 10in. working surface of table, with 4 automatic cycles to table.

SAWING MACHINES

RUSSELL 20/24in. Cold Circular Sawing Machine, with hydraulic clamping to vice.
NOBLE & LUND 11/16in. Cold Circular Sawing Machine.

SHEARING MACHINE

RUSHWORTH 10ft. 0in. by ¼in. Overcrank Guillotine Shearing Machine.

SURFACE GRINDING MACHINES

EXCEL No. 3A Hydraulic Horizontal Spindle Surface Grinder, 24in. by 8in. capacity.
LUMSDEN 92LE Vertical Spindle Rotary Table Surface Grinder, 48in. diameter table.

All the above machines are motorised 400-440/3/50 cycles.

JOHN CASHMORE LTD.
NEWPORT 1, MON.
Tel.: Newport 66941 (5 lines).
(Also at Great Bridge, Staffs.)

H. BELL (MACHINE TOOLS) LTD

Offer from stock:

KEARNS OA Horizontal Borer with facing head and oversize table. Wartime machine.
CHURCHILL 4-spindle Conomatic Bar Auto, cap. 1½in. With bar feed equipment, etc. Two drilling spindles.
CHURCHILL No. 1 Planetary Type Internal Grinder. Cap. with largest internal spindle 10in. dia. by 18in. length. Hydraulic operation with 4 internal grinding spindles, dust extraction unit, etc. Reconditioned.
WILLSON 7½in. S.S. & S.C. Gap Bed Lathe. A.G.H. Admits 4ft. 6in. between centres and 26in. in gap.
WARD No. 7 Capstan with covered bed. Speeds to 750 r.p.m. Air-operated chuck.
BARDONS & OLIVER No. 5 Capstan. Swing over bed 18in. dia. 12 speeds 32-855 r.p.m.
HELLER Automatic Internal Thread Miller. Model UGF50/150. Hydraulic operation.
HERBERT 33 Plain Miller. Table 38½in. by 10½in. Speeds 37-500 r.p.m.
SWIFT 12½in. S.S. & S.C. Gap Bed Lathe. A.G.H. Admits 7ft. between centres and 45in. in gap. Spindle bore 3½in.
ASQUITH 28in. Heavy Duty Vertical Miller. Table 48in. by 14in. Speeds 33-500 r.p.m. Power all ways.
KENDALL & GENT Model 6-3 Screwing Machine. Cap. ¼in.-3in. bolts and 1in.-6in. tubes. Tangential die head.
CLIFTON & BAIRD 24in. Automatic Cold Saw. Admits 24in. blades to cut 8in. rounds. Hydraulic clamping. Automatic hydraulic infeed for continuous cutting.
LECRA 18ND Inclinable Press. Cap. 10 tons. Stroke 1½in. With strip feed.
DAVID BROWN Hob Relieving Lathe. A.G.H. Motorised grinding head, profile slide, internal spindles, etc.

For full list of modern motorised machine tools write or 'phone:—

H. BELL (MACHINE TOOLS) LTD
WALTER STREET, LEEDS, 4
Tel. 637398-9.

Newman for MACHINE TOOLS

CAPSTAN & CENTRE LATHES

BRADFORD 8½in. centre height by 30in. between centres Centre Lathe.
HERBERT No 8 Combination Turret Lathe.
HERBERT No. 12 Combination Turret Lathe with comprehensive tooling.
NILES Centre Lathes 13½in. centre height by 27ft. between centres. (Two available.)
BETTS-BRIDGFORD Centre Lathe, 15in. centre height by 16ft. between centres. (Two available.)
WARD No. 7 Combination Turret Lathe.

AUTOMATICS

PONGRACZ Single Spindle Automatic capacity 10 mm.
CONOMATICS 3½in. four-spindle Bar Automatics. (Three available.)
BULLARD 8in. six-spindle Vertical Chucking Automatic.

NEWMAN INDUSTRIES LTD.
YATE · BRISTOL
Telephone: CHIPPING SODBURY 3321

CENTAUR

MACHINES OF QUALITY

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 11in. Gap Bed Lathe by 8ft. 0in. b.c. Hole in spindle 3½in. dia. 400-440/3/50.
MITCHELL OF KEIGHLEY 10½in. Gap Bed Lathe by 5ft. 5in. b.c. 400-440/3/50.
MITCHELL OF KEIGHLEY 12½in. Gap Bed Lathe by 6ft. 9in. b.c. 400-440/3/50
EXCEL No. 3/12 Hydraulic Horizontal Spindle Surface Grinding Machine. Capacity 24in. by 8in. Coolant equipment. Motorised 400-440/3/50.
VICTORIA V2 Vertical Milling Machine. Spindle speeds 32-1,050 r.p.m. Table 45in. by 11in. Table traverse 29½in. 400-440/3/50.
VICTORIA U2 Universal Milling Machine. Spindle speeds 30-1,010 r.p.m. Table 45in. by 11in. Longitudinal traverse 30in. 400-440/3/50.

NEW MACHINE TOOLS FOR EARLY DELIVERY

MITCHELL OF KEIGHLEY 8½in. Gap Bed Lathe by 5ft. 3in. b.c. 400-440/3/50. DELIVERY: August, 1958.

USED MACHINE TOOLS

NORTON Horizontal Spindle Hydraulic Surface Grinding Machine, with hydraulic cross feed head. Capacity 48in. by 10in. Complete with D.C. magnetic chuck and generator. Coolant pump and fittings. 400-440/3/50.
HERBERT No. 4 Capstan Lathe, with drawback collet, and power feed to turret slide. 400-440/3/50.
NEWALL Hydraulic "XL" 6in. by 18in. Plain Grinding Machine. 400-440/3/50.
NEWALL Type L 10in. by 24in. Plain Grinding Machine. 400-440/3/50.
LE BLOND A.G.H. S. & S. Lathe, 15in. dia. swing. 400-440/3/50.
HULLER No. 5 Vertical Tapping Machine. 400-440/3/50.
POLLARD 21A Single Spindle Vertical Production Drilling Machine.
WICKSTEED Hydraulic 28in. Cold Sawing Machine. 400-440/3/50.
ARCHDALE 18in. High Speed Vertical Milling Machine. Table size 38in. by 10in. Spindle speeds 79-2,000 r.p.m. 400-440/3/50.
DEAN SMITH & GRACE 12in. Gap Bed Lathe by 8ft. 6in. b.c. 400-440/3/50.
HENDEY 18in. by 54in. Toolroom Lathe, with taper turning. 400-440/3/50.
BROWN & SHARPE No. 2 Light Plain Milling Machine, with dividing head, and universal vertical head. 400-440/3/50.
ARCHDALE 20in. Horizontal Plain Milling Machine, longitudinal feed 20in. 400-440/3/50.

WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS.

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18.
Tel.: EDGbaston 1118 & 1119 Grams: Capstan, Birmingham

SOAG

OFFER

AT ATTRACTIVE PRICES

Long Bed and Heavy Duty LATHES

32in. **HARVEY** Break Drum Lathe, with sliding bed, motor drive. Swing in gap 9ft., swing over bed 65in., admits between centres 25ft.
30½in. **HARVEY** Long Bed S.S. & S.C. Lathe, motor drive, two saddles, with rapid power traverse, swing over bed 61in., admits between centres 61ft.
19in. **CRAVEN** S.S. & S.C. Lathe, motor drive vee bed, swing over bed 38in., swing over saddles 26in., admits between centres 28ft.
18in. **LE BLOND** Heavy Duty Geared Head Engine Lathe, size 32in. Admits between centres 28ft.
16in. **FAIRBAIRN LAWSON** Heavy Duty S.S. & S.C. Lathe, motor drive, swing over saddle 23in., admits between centres 15ft.
13½in. **MONARCH** Geared Head S.S. & S.C. Lathe, type CM, 24in., motor drive, swing over carriage 14in., between centres 24ft.

INSPECTION INVITED

Buy now and Save Money

Full details from:

SOAG MACHINE TOOLS LTD.,
JUXON STREET, LAMBETH, LONDON, S.E.11.
'Phone: RELiance 7201.
'Grams: "Sotoolsag," London, S.E.11.

Ahcol Semi-Automatic Rotary Milling Machine, in excellent order, ideal for 2nd op. op. work in Auto shop.—BOX Z228, MACHINERY, Clifton House, Euston Road, N.W.1.

Hydraulic Press of 12 Tons capacity. Drummond Electraulic model ABN.12.—BOX Z238, MACHINERY, Clifton House, Euston Road, N.W.1.

Newman for MACHINE TOOLS

GRINDING MACHINES

SCRIVENER No. 2 Centreless Grinding Machine.
New **EXCEL** No. 3 Hydraulic Surface Grinding Machine.
NORTON Universal Grinding Machine, Type "C", capacity 12in. by 36in.
CHURCHILL Universal Grinding Machine, 10in. by 24in. between centres.
B.S.A. LANDIS Type "C" Plain Hydraulic Cylindrical Grinding Machine, 6in. by 30in. (Two available.)
CHURCHILL Model HBY Internal Grinding Machine.
EXCEL No. 3 Horizontal Spindle Hydraulic Surface Grinding Machine, 24in. by 8in. with magnetic chuck.

GEAR MACHINES

MUIR 72in. spur and helical Gear Generating Machine.
KOLB Gear Grinding Machine.
GLEASON No. 9 Bevel Gear Completor Machine.

NEWMAN INDUSTRIES LTD.
YATE · BRISTOL
Telephone: CHIPPING SODBURY 3311

Edwards

RHODES Motorised Double Geared Press Brake, with cast-iron frames, reinforced by nickel-chrome steel bars. Bed and top beams are of steel plate. Arranged motor drive for 400/3/50. One top 90 deg. forming tool supplied, also one bottom die with two vee openings 1½in. and 1¼in. wide. Pressure exerted 150 tons. Forming capacity 10ft. by $\frac{3}{16}$in. or 18ft. by approximately ⅛in. Clear width between housings 10ft. 2in.
BESCO Size R150/10 All Steel Press Brake, of steel plate construction. Arranged motor drive for 380-420/3/50. Pressure exerted 150 tons. Forming capacity 10ft. by $\frac{3}{16}$in. Die opening 1½in. Between housings 120in. Depth of gap 12in.
NEW **BRUECK** Type 20/1600 All Steel Motorised Press Brake. Geared steel-plate construction. Arranged motor drive for 400-440/3/50. Maximum pressure 20 tons. Forming capacity 63in. by ¼in. Maximum working length 63½in. Weight approximately 36 cwt.
NEW **CHICAGO** No. 320 Portable Hand Operated Folding Machine. All steel construction. Capacity 48½in. by 20 s.w.g. Provided with an adjustable angle stop for repetition bending.
BESCO Universal Swing Beam Folding Machine, mounted on cast-iron stand. Capacity 36½in. by 16 s.w.g. mild steel. Steel top clamping beam fitted with a detachable blade, lifts to a height of 4½in. to enable tray sections to be formed with the use of an angle blade. Size of top beam 3½in. wide over blade by 2⅞in. high. Weight approximately 7¾ cwt.
BESCO Heavy Universal Edging, Bending and Folding Machine. Capacity 8ft. 2in. by 16 gauge. Fitted with centre supporting leg to strengthen bottom bed. An angle stop is also fitted for repetition work. Complete with one sharp edge blade only. Blades are quickly interchangeable. Adjustable back gauge is also supplied. Approximate weight 3,100 lb.

Photographs of the above are available.

MACHINE TOOLS, NEW AND USED,
Of Every Description. Attractive Prices.

F. J. EDWARDS LTD.,
359-361, EUSTON RD., LONDON, N.W.1
Telephone: EUSTON 4681-3771.
And at Lansdowne House, 41, Water St., Birmingham, 3. *Telephone: Central 7606-8*

Hydraulic Presses

Large stock of single action and double action Presses for all duties.

PRESSES BUILT TO CUSTOMERS' SPECIAL REQUIREMENTS.

REED BROTHERS (ENGINEERING) LTD.,
Replant Works,
Woolwich Industrial Estate,
London, S.E.18.
Telephone: WOOlwich 7611/6.

Sciaky Type R.A.M.C. 50 Seam Welder and a B.I.C.C. 50 k.v.a. Spot Welder type P155A.—BOX Z193, MACHINERY, Clifton House, Euston Road, N.W.1.

Gisholt Nos. 3 and 4 A.G.H. Turret Lathes in very nice condition.—BOX Z276, MACHINERY, Clifton House, Euston Road, N.W.1.

HARRY KIRK

can recommend the following modern quality machines from STOCK:

SAFAG No. 1_1 Type 3 Motorised Pinion Cutter.
WEBSTER & BENNETT 48in. Vertical Boring and Turning Mill.
CHURCHILL Model RBY 24in. Rotary Surface Grinding Machine.
KEARNS No. 2 HORIZONTAL BORING, MILLING, DRILLING AND FACING MACHINE, 3in. sliding spindle, 30in. dia. facing cap. Size of top table 48in. by 48in.
SWIFT 4ft. RADIAL DRILLING MACHINE. Elevating arm, box table.
BROWN & SHARPE HORIZONTAL SPINDLE SURFACE GRINDING MACHINE. Capacity 18in. by 6in.
HERBERT No. 4 AUTOMATIC CHUCKING LATHE.
PARKINSON No. 3J UNIVERSAL MILLING MACHINE.
PRATT & WHITNEY 12in. STROKE SLOTTING MACHINE. Tilting ram.
MODERN OPTICAL PROFILE GRINDING MACHINE.
LANG JUNIOR CENTRE LATHE. Capacity 6¼in. centre height by 30in. between centres.
CHURCHILL-REDMAN HEAVY DUTY SHAPING MACHINE, 24in. stroke, swivelling vice, 10 h.p. motor.
BUTLER 8in. STROKE SLOTTING MACHINE, with tilting table.
B.S.A. 9in. SINGLE SPINDLE CHUCKING AUTOMATIC. Complete with air-operated chuck.
KITCHEN & WADE VERTICAL FINE BORING MACHINE. 14in. stroke. Compound table.
KITCHEN & WADE HEAVY DUTY PILLAR DRILL. No. 5 Morse. Speeds 22-1,000 r.p.m.
CHURCHILL 12in. by 36in. UNIVERSAL HYDRAULIC GRINDING MACHINE.

Further details from

HARRY KIRK ENGINEERING LTD.
BRANDON ROAD WORKS, BRANDON ROAD, COVENTRY.
'Phone: WALSGRAVE-ON-SOWE 2213/4.

TATE

JONES SHIPMAN Fig. 1204 EIUR 8in. by 22in. Universal Grinding machine with Rising and Falling Wheelhead etc. 3 years old.

TATE MACHINE TOOL CO., LTD.
6 North End Parade,
Opposite Olympia, London, W.14.
FULham 6563/4/5

Huller U.G.5 Tapping Machine. Cap. 1$\frac{1}{16}$in. steel. Controlled pitch. Speeds 100-560. Mot.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

Heald 81 Gagematic Internal Grinder with automatic diamond dressing and hydraulic feeds.—BOX Z397, MACHINERY, Clifton House, Euston Road, N.W.1.

Several OG Brown & Sharpe Automatics, capacity 5/8, 8,400 series. Some with third slides and slotting attachments.—BOX Z247, MACHINERY, Clifton House Euston Road, N.W.1.

Clifton & Baird Cold Saw With hydraulic feed. Saw dia. 18in. Also Noble and Lund ditto.—BOX Z305, MACHINERY, Clifton House, Euston Road, N.W.1

Several Flexible Drive Sanding Machines, Pedestal type 400/3/50 electrics. £30 each.—BOX Z199, MACHINERY, Clifton House, Euston Road, N.W.1.

Toggle Drawing Presses, Kieserling & Albrecht, 3,000 tons, 2,000 tons, 1,500 tons and 800 tons of pressure (1940). Motorised. Good condition.—Enquiries invited to: DR.-ING. EMIL LINGEMANN, Rather Str. 49, Dusseldorf, Germany.

Scrivener No. 2 Centreless Grinder. Model No. C. Fitted through guides. Motorised.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

Cochran Vertical Steam Boilers, 900 lb. and 1,200 lb. per hour, for disposal. May be seen in commission and all Insurance reports available.—H. & E. ENGINEERS LTD. 68, Wytham Street, Oxford.

Edwards Power Guillotine 36in. by 14G. with motor.—BOX Z183, MACHINERY, Clifton House, Euston Road, N.W.1.

Rushworth Power Guillotine 8-ft. by 1$\frac{1}{16}$in.—BOX Z189, MACHINERY, Clifton House, Euston Road, N.W.1.

"New Process" 60 kVA Side Seam Welding Machine for Drums for sale. Suitable for diameters from 8½in. to 36in. Depth of throat 17½in. Welding speed about 6ft. per minute for two thicknesses of 18 S.W.G. steel. Suitable for 440/3/50. Four speed drive.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

Sheet Metal Working Plant For sale, including automatic lathe and pillar drill, welding plant, etc. Heavy wood benches and some metal stocks. Items can be sold separately.—Telephone: ARChway 2601.

One Universal Boring and Facing Head Type U.P.A., size 6 by M.S.E. Limited. Maximum capacity 22·4in. In brand new condition.—BOX Z222, MACHINERY, Clifton House, Euston Road, N.W.1.

AUCTIONS

By Order of EDEN PRECISION CO., LTD., who are relinquishing business.
9 and 12A, HIGH ROAD, ILFORD, ESSEX.

HENRY BUTCHER & CO.

are instructed to offer for SALE BY AUCTION in LOTS at THE WORKS on

WEDNESDAY, 27th AUGUST, 1958, at ELEVEN A.M., the

MACHINE TOOLS, STORES & EQUIPMENT

including

CAPSTAN AND TURRET LATHES by Herbert, C.V.A., Murad, Gisholt and Bardons and Oliver

RADIAL AND PILLAR DRILLING MACHINES

VERTICAL AND HORIZONTAL MILLERS by Cincinnati, Archdale, Herbert and Milwaukee

S.S. & S.C. LATHES by Colchester, Empire, Southbend, Smart & Brown and Willson

SHAPING MACHINES, UP TO 20in. STROKE

CYLINDRICAL, SURFACE AND UNIVERSAL GRINDERS

Screw Fly Presses; Power Hacksaws; Guillotines;

GRINDING, SLOTTING AND TAPPING MACHINES

HONING, FILING AND KEYSEATING MACHINES

D.E. Tool Grinders; Bandsaws; Furnaces; D.E. Polishing Spindles

STOCK OF FERROUS AND NON-FERROUS RAW MATERIALS

ENGINEERS' SMALL TOOLS AND EQUIPMENT

Benches; Storage Racks and Bins

OFFICE FURNITURE AND EQUIPMENT

Catalogues (when ready), price 6d. each, may be obtained of: Messrs. Henry Butcher & Co., Auctioneers, Surveyors and Valuers of Factories, Plant and Equipment, 73, Chancery Lane, London, W.C.2. Telephone: HOLborn 8411 (8 lines).

By Order of the E. R. Minister of Supply

Messrs.

FULLER HORSEY Sons & Cassell

have been instructed to offer for SALE BY AUCTION in Lots at the ROYAL ARSENAL, WOOLWICH, LONDON, S.E.18, on **TUESDAY, 26th AUGUST, 1958,** and following days at 10.30 a.m. precisely each day

ENGINEERS' MACHINE TOOLS MOTOR VEHICLES, INDUSTRIAL EQUIPMENT AND SURPLUS STORES

including Town 48in. RADIAL DRILLING MACHINE; Herbert No. 9 COMBINATION TURRET LATHE; Bullard VERTICAL TURRET LATHE; eight Ward No. 7 COMBINATION TURRET LATHES; Plain and Universal GRINDING MACHINES; Plain, Universal, Vertical and Horizontal MILLING MACHINES; S.S. & S.C. LATHES; Shaping, Slotting, Engraving, Drilling and Hacksawing Machines; approximately 260 VEHICLES including 30 Austin, Hillman and Humber LIGHT and HEAVY UTILITIES; 120 Bedford and Morris 1 TON and 3 TON TRUCKS; 5 Austin "LODESTARS"; 36 Bedford and Morris TRACTORS and 18 SALOON CARS; SCRAP BATTERIES, Diesel and Petrol-Electric Generating and Charging Sets, Mobile Compressor Plants, Welding Plants, 14 OVERHEAD ELECTRIC TRAVELLING CRANES from 10 to 40 tons capacity, 42ft. 3in. span; Fork Lift and Petrol and Electric Industrial Trucks; 8,500 Concrete Sleepers; 700 tons OLD TIMBER SLEEPERS; 400 Tons BRIDGING EQUIPMENT; SPARES for SELF PROPELLED ROLLERS, Portable STONE CRUSHERS and GRANULATORS, COLD STORES and RUSTON HORNSBY 4VRO ENGINES; 140 tons GRAVITY ROLLER and STANDS; RADIO and ELECTRICAL STORES and EQUIPMENT; large quantity miscellaneous CLOTHING and FOOTWEAR; 125,000 CAP COMFORTERS; 25,000 KITBAGS; 340,000 Khaki Worsted Braid Ties; 160,000 WOOLLEN SHORT DRAWERS; 5,000 GREATCOATS; 36,000 WOOLLEN VESTS; 145,000 SLIDING FASTENERS; 225,000 COPS COTTON and LINEN THREAD & 245,000 Boot and Button Brushes, Barrack Room Furniture, PRISMATIC BINOCULARS, COMPASSES; Cameras, Engineers' and Carpenters' Tools and numerous other effects.

Catalogues, 1s. each, admitting two persons on view days (Wednesday, Thursday, Friday and Monday preceding Sale) and one on Sale days, may be had when ready, from the Auctioneers' Offices, Dept. W.10 Lloyds Avenue, London, E.C.3.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

Charge Hand Required for Trade Toolmaking Organisation—must be sound practicable grinder and good disciplinarian. London area.—BOX Z168, MACHINERY, Clifton House, Euston Road, N.W.1.

Chief Project and Development Engineer required for work on automatic and semi-automatic special-purpose machines and machine tools. This is a senior appointment carrying a considerable degree of responsibility, and the salary will be commensurate. Future prospects are very good for a man who has the necessary ability, drive and initiative.—Write: MANAGING DIRECTOR, BRISTOL REPETITION LIMITED, Bristol 2.

Machine Component Controller required by Company manufacturing light engineering components in S.W. Middlesex. Applicants must have held a position of responsibility and have a sound basic engineering knowledge either by qualifications or experience. The successful applicant will be responsible for the requisitioning of raw materials, machine loading and progress of approximately 500,000 piece parts per week. Please write stating full details of age, qualifications, experience and salary required to Personnel Officer.—BOX Z221 MACHINERY, Clifton House, Euston Road, N.W.1.

Classified Advertisements (*SITUATIONS VACANT, contd.*)

Universal Miller. Plastic Moulding Tool experience essential. Trade Shop.—PLAYDEN TOOLS LTD., Harold Wood. Ingrebourne 3874.

REPRESENTATIVES

Draughtsman To Act as Sales Representative required in small expanding Die-Casting Company. Comprehensive knowledge of the industry including experience in contacting prospective customers is essential. Write stating age, experience and salary required.—BOX Z146, MACHINERY, Clifton House, Euston Road, N.W.1.

M.T.S. Limited Require Services of two more Resident Sales Representatives covering Midland area, London and Southern England. Comprehensive range of new machine tools, some of unique design. Showroom and service facilities available. Only men with initiative, possessing connections and experience considered. Car an advantage. Salary, commission and bonus.—Fullest details and photo to 79, Portland Place, London, W.1.

Tungsten Carbide Tool Sales-men required for various areas by leading manufacturers. Only applications giving full particulars of education, experience, age and salary required will be considered. Car provided. Pension Scheme.—Apply BOX Z217, MACHINERY, Clifton House, Euston Road, N.W.1.

The Metal Industries Group of Companies
IGRANIC ELECTRIC CO. LTD.
a subsidiary company of the Group, require:—

Technical representatives operating from London, Birmingham and Manchester to handle sales of Electro-magnetic clutches. Sound mechanical engineering and machine tool design knowledge with ability to discuss clutch applications at Chief Engineer level are essential qualifications. Applications with full details of experience to be addressed to:

The Personnel Officer,
Igranic Electric Co. Ltd., Bedford.

Small Tools (Cutters). Manu-facturers of nationally advertised products require Agents N.E., S.E., and N.W. England. Similar sales experience with proved ability to increase existing connection essential.—Details to BOX Z180, MACHINERY, Clifton House, Euston Road, N.W.1.

SITUATIONS WANTED

Engineer, Production, A.M.I.P.E. Age 45.
Practical approach with substantial experience production engineering and control all functions.
Organisation and cost conscious.
Seeks responsible interesting and active post.
BOX Z202, MACHINERY, Clifton House, Euston Road, N.W.1.

Mechanical Draughtsman Re-quires position Central London, Brighton or intermediate. Ordinary National Certificate Standard. Two years drawing office, twelve years toolroom.—BOX Z219, MACHINERY, Clifton House, Euston Road, N.W.1.

REPRESENTATIVES

Representative. Personnel Manager, Trained Engineer, requires position as representative in engineering or allied trade.—Please reply BOX Z181, MACHINERY, Clifton House, Euston Road, N.W.1.

Agent Covering Principal industrial buyers Midlands/ S. Wales/ Bristol, offers intelligent representation in this area to manufacturer of repute.—BOX Z213, MACHINERY, Clifton House, Euston Road, N.W.1.

RECEIVED TOO LATE FOR CLASSIFICATION

PLANT WANTED

Small Planer, 3ft./4ft. by 2ft. 6in. Good condition.—FARLEY ENG. (CROYDON), LTD., Gladstone Road, East Croydon.

Set of Slip Gauges Required. Write stating range and price required.—BULGIN, Bye-Pass Road, Barking.

Wanted: 6ft. Girder Radial and Cincinnati No. 3 Centreless Grinder.—Details to BOX Z215, MACHINERY, Clifton House, Euston Road, N.W.1.

PATENTS—TRADE MARKS

Patent No. 722286, " Drawbench with One or More Longitudinally Moved Draw Trolleys."
The Proprietors of Patent 722286 desire to enter into arrangements by way of licence or otherwise on reasonable terms to ensure its full development and commercial working in this country.
Address enquiries to: W. P. THOMPSON & CO., Chartered Patent & Trade Mark Agents, 12, Church Street, Liverpool, 1.

MACHINERY'S

SMALL ADVERTISEMENTS

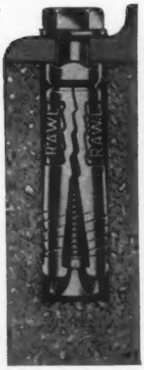
BRING RESULTS

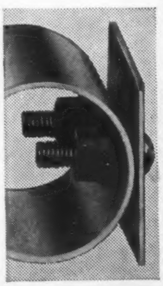
Use form on Page 140

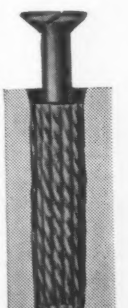
INDEX TO ADVERTISERS

(Continued on page 144)

INDEX TO ADVERTISERS—*(continued from page 143)*







Published by THE MACHINERY PUBLISHING CO., LTD., at their Office, Clifton House, 83-117, Euston Rd., London, N.W.1. Telephone Euston 8441.
LONDON: HARRISON & SONS, LTD., by Appointment to Her Majesty The Queen, Printers, London, Hayes (Middx.) and High Wycombe.